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ABSTRACT

The science education reform movement is difficult for parents to understand because the new constructivist paradigm is far afield from science education as parents experienced it themselves. Educators in a New England middle school developed a new science curriculum without inviting general parental input. The problem addressed by this study was that the school had not provided an opportunity for parents to express their views, to understand the program, or to contribute in any other way to the development of the science curriculum. This study invited parent involvement in order to determine parent perspectives about the program and to examine ways in which parents might contribute to curriculum development. The study began with a survey of all of the school's parents and science teachers to determine their perceptions of the science program. Parent focus groups were held to clarify and enrich survey data. A Project Improvement Team of parents and teachers analyzed the survey and focus group data and developed an action plan for improving the science program. Transcripts of the meetings of the Project Improvement Team, individual interviews of all members of the Team, and a researcher's journal provided data regarding the process of parent involvement. Parents and teachers seemed to share three successive roles as they worked together on the Project Improvement Team: (1) Providers of Information; (2) Collaborators; and (3) Partners in Implementing and Improving the Science Program. Attitudes toward the process of parent involvement appeared to become more positive as the levels of involvement intensified. This study offered one process for authentically involving parents in program development. Parents and teachers offered different perspectives about the strengths and weaknesses of the curriculum probably because they interacted with the children in different ways. Parents and teachers demonstrated that they could work together to enhance school programs for the benefit of students. (Author/NB)

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ENGAGING COMMUNITY MEMBERS IN CONSTRUCTIVIST LEARNING: PARENT INVOLVEMENT IN THE DEVELOPMENT OF A MIDDLE SCHOOL SCIENCE CURRICULUM

by

Virginia Cribari King

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Professor Ann Lieberman, Sponsor
Professor Christopher Clark

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Virginia Cribari King

The science education reform movement is difficult for parents to understand because the new constructivist paradigm is far afield from science education as parents experienced it themselves. Educators in a New England middle school had developed a new science curriculum without inviting general parental input. Therefore, the problem that was addressed by this study was that the school had not provided opportunities for parents to express their views, to understand the program, or to contribute in any other way to the development of the science curriculum. The study invited parent involvement in order to determine parent perspectives about the program and to examine ways that parents might contribute to curriculum development.

The study began with a survey of all of the school's parents and science teachers to determine their perceptions of the science program. Parent focus groups were held to clarify and enrich survey data. A Project Improvement Team of parents and teachers analyzed the survey and focus group data and developed an action plan for improving the science program. Transcripts of the meetings of the Project Improvement Team, individual interviews of all members of the Team, and a researcher's journal provided data regarding the process of parent involvement.

Parents and teachers seemed to share three successive roles as they worked together on the Project Improvement Team: Providers of Information, Collaborators, and Partners in Implementing and Improving the Science Program. Furthermore, their attitudes toward the process of parent involvement appeared to become more positive as their levels of involvement intensified.

The study offered one process for authentically involving parents in program development. Parents and teachers offered different perspectives about the strengths and weaknesses of the curriculum, probably because they interacted with the children in different ways. Furthermore, parents and teachers demonstrated that they could work together to enhance school programs for the benefit of students.

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V. C. K.

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Chapter I

INTRODUCTION

I dreamed I stood in a studio
And watched two sculptors there
The clay they used was a young child's mind
And they fashioned it with care.

One was a teacher; the tools he used
Were books and music and art;
One a parent with a guiding hand,
And a gentle, loving heart.

Day after day the teacher toiled,
With touch that was deft and sure,
While the parent labored by his side
And polished and smoothed it o'er.

And when at last their task was done,
They were proud of what they had wrought,
For the things they had molded into the child
Could neither be sold nor bought.

And each agreed he would have failed
If he had worked alone.
For behind the teacher stood the school,
And behind the parent, the home.

Author Unknown

This study examined parent participation and involvement in curriculum development. Specifically, the study looked at one school's efforts to engage parents in the improvement of a science program at a middle school.

The study was based on a number of assumptions:

- Parent support is an important factor in program success.
- Parents who are involved in program development will be more likely to understand the program.
- Parents will communicate their perspectives about the strengths and weaknesses of a program.
- Educators and parents who are aware of each others' perspectives will work collaboratively to reach mutual agreement.
- Parents who have communicated their perspectives about a program and have worked collaboratively with educators will be more likely to reach mutually acceptable agreements and support the program.

Statement of the Problem

Science educators are experiencing a paradigm shift. The focus of science education is changing from that of science as a fixed set of facts to one of science as skills and processes based on factual knowledge (Aldridge, 1992; Hurd, 1991; Manning & Lucking, 1992; Rutherford & Ahlgren, 1989). The major organizations driving the reform movement at the present time are the National

Science Teachers Association (NSTA) and the American Association for the Advancement of Science (AAAS).

The science reform movement is a reflection of the times. Facts and information have increased phenomenally, and the lines between the traditional disciplines have blurred (Hurd, p. 33). For example, much attention in recent years has been focused on the AIDS epidemic. The search for a vaccine or a cure has been collaborative: virologists working with doctors, public health personnel, technicians, immunologists, etc. The old image of a scientist as a lonely eccentric, dressed in a laboratory coat, and unable to converse with other human beings is changing to one of a knowledgeable, computer-literate communicator who may still be a specialist in a limited area, but is familiar with a broad range of science disciplines and understands where and how to turn for answers that are not readily available.

Therefore, the reform movement seeks to bring science education into alignment with science in the real world by discarding the traditional "layer cake" approach which was established over 100 years ago. This old model stressed the importance of teaching separate subjects: biology, chemistry, physics, etc. (Brunkhorst, 1991, p. 36). The reform movement suggests that a thematic approach be used to connect the disciplines (Rutherford & Ahlgren, 1988, 1989; Benchmarks, 1993). Teaching science through a topic such as "Systems" or Models" (Benchmarks, p. 261) offers a way to bridge the isolated disciplines of the past.

For this new philosophy to be put into practice, the content of science courses must be re-examined to determine which concepts are most relevant. Simultaneously, the pedagogy must be redesigned to reflect teaching methods that promote active learning (Bowers, 1991; Collins, 1991; Crane, 1991; Dempster, 1992; Johnson & Johnson, 1991; West, 1992; Yager, 1988), an approach that is often called constructivism (Saunders, 1992).

Changes in science education are particularly difficult for parents to understand because the new constructivist paradigm is far afield from science education as parents experienced it themselves. As an example, most parents learned science from a lecture, textbook, question-and-answer approach. The major influences behind the science reform movement recommend eliminating textbooks and replacing them with multiple resources and varied teaching strategies (Yager & Muther, 1986). For parents who were dependent on textbooks, the multiple resources approach is foreign.

Other components of the science reform movement that pose problems for parents are its emphasis on hands-on experiences and alternative assessments. While many educators espouse these approaches, it is hard for some parents to recognize that the extra time that is required for projects, laboratory activities, demonstrations, or exhibits may reap the benefits of their children's greater understanding. A parent at the school that is the site of this study recently said, "Projects are a waste of time. My child can learn ten times as much in one-tenth of the time by reading a textbook." This statement reflects the different perspectives that parents and teachers often hold, perspectives that reflect the vantage points of both groups. In this case, teachers see the value of projects in terms of student involvement, ownership, and in-depth learning; parents see less coverage of content. Neither viewpoint is right nor wrong, but the diversity of opinions may provide the basis for discussions between parents and teachers.

Another reason that parents and teachers view the science program from different perspectives is because they interact with students under different circumstances and in separate ways. Parents usually deal one-on-one with their child's academics, parent with child, helping with homework or overseeing it. A parent who expects to see a student reading a text and answering questions may be taken aback when the homework assignment is, "Teach today's lab to members of your family, and record their impressions of how the underlying concepts are applicable to their lives," or "Boil a red cabbage leaf to make an acid-base indicator. Then test at least five liquids found in your home for acidity or basicity."

On the other hand, the teacher who follows the suggestions of the science reformers sees a room of students interacting cooperatively, using on-line and varied resources, and pooling their talents to solve problems. Parents and teachers see both science education and today's students from different perspectives. Therefore, both can offer insights to shape the curriculum.

The literature of parent involvement supports the notion that parent involvement in schools is desirable. However, while there are many studies of the relationships between student achievement and family demographics (Walberg & Marjoribanks, 1987), home tutoring (Banks-Williams, 1991), and parents volunteering or working in schools (Comer, 1988), there is a scarcity of knowledge and understanding regarding how parents may be involved in the development of school programs, how their voices may be heard, and how they may participate in school reform efforts.

District Background

The school that is the site of this study is located in a district that is heavily invested in a school improvement model that includes a mission statement, core beliefs, and an action plan. Based on the systems management principles of Total Quality Management (TQM), the model was developed collaboratively with input from many of the district's educators. Like the parent involvement literature, TQM supports the notion that involvement of all major stakeholders is a good thing and that greater involvement leads to greater ownership and greater satisfaction of stakeholders (Deming, 1986; Walton, 1986, 1991).

Science Program

In the town that is the site of this study, I facilitated the development of a middle school science curriculum that was implemented in September, 1992.

The curriculum was developed collaboratively by a committee of science teachers who were influenced by the recommendations of the National Science Teachers Association (NSTA) and the American Association for the Advancement of Science (AAAS). Formal student input was sought during the 1992-93 and 1993-94 school years via a student survey and focus groups. However, until this study began, general parental input regarding the program had not been invited. While parents had been involved through a Panel of Experts[1] which met regularly with the teachers on the curriculum writing team, the Panel's efforts were focused on sharing suggestions for additional resources. However, parents had been invited neither to express their views nor to contribute in any other way to the development of the science curriculum. This gap served as the basis for this study. The study invited parent involvement in order to consider ways that parents might contribute to the program as well as to determine procedures to engage them.

In terms of educational research, although the literature supports the notion that parent involvement is important, there have been few attempts to involve parents in curriculum development. This study attempted to fill that gap by examining one school's efforts to promote parent participation and involvement in curriculum development and thereby increase the knowledge base in the area of parent involvement.

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[1] A Panel of Experts, approximately eight present and past Middle School parents who work in various disciplines of science, met periodically with the curriculum writers to offer advice on content and resources.

Dual Roles: Researcher and School Administrator

I am presently an assistant principal at the school. In prior years, I taught science at all three grade levels and also served as the department coordinator. Furthermore, I have been involved with the development of the school's new science curriculum from its inception and have clearly defined opinions about what constitutes a good science curriculum, views that are supported by both my experiences as an educator and the literature of science education reform. It was my ownership of the program and commitment to it that led me to consider ways to improve it. This, in turn, aroused my interest in parent involvement as a means for the improvement. While I was, and continue to be, involved and committed to the success of the school's science program, I was able to stand back regarding the issue of parent involvement. Bruner (1988) stated that, "The mind is never free of precommitment" (p. 582). I believe that precommitment was a distinct advantage to this study because it led me to a new area of interest, the process of engaging parents in the reform of the science program.

Purpose of the Study

The purpose of the study was to examine one school's efforts to promote parent participation and involvement in the reform of a middle school science program.

Research Questions

The following two research questions were asked:

1. What happens when parents and teachers seek to collaborate in the reform of the science program?[2]
2. What procedures can be used to involve parents in curriculum development?

Initially, this study contained another research question that focused on parent and teacher perceptions about the science program at the school. This one was later eliminated because I realized that the data that I collected was irrelevant to my study of parent involvement. However, the data was extremely important as a means for authentically engaging parents.

Significance of the Study

There is general agreement that parents should be involved in schools and that engaging parents can enhance the likelihood of their support. However, there has been little focus on parent involvement in school programs.

This study attempted to fill this void by determining how parents can collaborate with teachers, what happens in the involvement process, and what processes may be used to engage parents in curriculum development.

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[2] For the purposes of this study, collaboration is defined as parents and teachers working together for the continuous improvement of the program.

Chapter II

REVIEW OF THE LITERATURE

Overall Plan for Literature Review

Three bodies of literature informed this study: parent involvement, school change, and science education reform. All three were needed because the study attempted to involve parents in changing the science program at a school.

The parent involvement literature informed the study in two ways. First, it established general agreement that parental involvement is desirable. Researchers recognize that parents are valuable members of the school community (Fullan & Stiegelbauer, 1991; Barth, 1988). They also see a shift in thinking in recent years. Whereas teachers formerly thought of themselves as needing to compensate for parental weaknesses, they now see parents as potentially positive influences on their children's educations (Wikely & Hughes, 1994). Becker and Epstein (1987) report that parent involvement not only increases home-school communication but also affects school improvement positively. They continue to say, "Parental attitudes toward teachers and administrators improve as a result of the cooperation between home and school when schools take an active role in involving parents (p. 133). Furthermore, parents pay the taxes that support public education. Therefore, they may be considered to be the customers of the schools. As such, they are entitled to state their viewpoints and to expect that these will be respected (Deming, 1986; Glasser, 1990).

Epstein's (1985) study of parents' and principals' ratings of teachers' merits supports the belief that parents offer perspectives that differ from those of educators. She states, "Principals' ratings are influenced by situational factors and the extra work that established some teachers' leadership. Parents' ratings are influenced by the connections teachers make with families and the quality of classroom life their children experience" (p. 3). Parents and teachers see children in different settings. It follows that parent and teacher perspectives differ. Similarly, parents and teachers will view parent involvement in the schools from different vantage points. In the town that is the site of this study, parents had been the missing voice in the process of developing the middle school science program. This study offered an opportunity both to engage them in the development of the program and examine the parent involvement process that was employed in the study.

The second aspect of this study that was informed by the literature was that of the process that school educators developed to involve the parents in the science program. The school change literature is a valuable resource for guidance in facilitating school improvement efforts such as the development of a new science program (Bonstingl, 1992a, b, c, d; 1986; Fullan, 1991; Glasser, 1984, 1986, 1990, 1992; Imai, 1986; Juran, 1989; Sarason, 1982; Walton, 1986, 1991). There is general agreement that change must be viewed as a process rather than an event (Fullan, 1991, p. 49); what is defined as a quality program today will not be a quality program tomorrow unless it evolves as times and needs change (Deming, 1986; Bonstingl, 1992b; Glasser, 1990). For the purposes of this study, this concept is called continuous improvement. In addition, a second concept shared by the change theorists is that collaboration is important if all members of the school community are to understand and support school programs. Therefore, continuous improvement and collaboration are the two themes underlying the change process. Both are important to this study.

School change literature not only provided information on processes that may be implemented to effect change, but also by offering an opportunity to expand the knowledge base. Many school leaders have been trained in the principles of TQM, but struggle to apply these business-based principles to school settings. The problem is often one of language, but the literature supports the fact that related studies are scarce and are largely limited to business-related issues such as school finance. This study attempted to add to that knowledge base by considering applications of the principles of Total Quality Management to the curriculum development.

Third, the literature of science education reform informed the science aspect of the study. Although the purpose of the study was to increase the knowledge base regarding the involvement of parents in school programs, the program that provided the vehicle to study parent involvement was science. It was necessary to look at the science education literature in order to be informed about the science program at the school. Why did the school's educators believe so strongly that hands-on activities enhance student understanding? What did they believe the components of an exemplary middle school science program to be? The literature of science education reform, therefore, contributed the knowledge base that informed the comparative analysis of parents' and educators' perspectives. Coincidentally, the themes of continuous improvement and collaboration are at the heart of science education reform as well as change theory. In this study, the process of developing a new science curriculum was a microcosmic application of a macrocosmic change process that emphasized continuous improvement and collaboration. The study, therefore, integrated the change theory and science education reform literatures with respect to these two themes.

The study offered an opportunity to attempt to increase knowledge in the area of science education reform because this literature base does not address the issue of parent involvement. While it emphasizes the need for teachers to collaborate and develop curricula locally, there is no mention of the role of the parents. The parent involvement literature informed the purpose of the study, the school change literature contributed knowledge regarding the processes of change, and the literature of science education reform presented information that was necessary in order to understand the depth, breadth, and issues of the changing paradigm. All three components of the literature were critical to the study.

Parent Involvement

> If there is close communication, cooperation, sincere caring,... there seems to be no limit to what might happen--students learn more, teachers are more fulfilled, and parents feel better about their children and themselves. (Brandt, 1979, p. v)

While there is evidence that there is a relationship between parent involvement levels and qualities of schools such as teacher efficacy and instructional coordination (Hoover-Dempsey, Hassler, & Brissie, 1987, p. 433), there is no consensus on which types of involvement are most beneficial to either students or schools.

Factors that contribute to parent involvement in schools include parental orientation to education in general, the financial and social resources of the parents, and the opportunities that the schools offer for parents to become engaged (Schneider, 1993, in Schneider & Coleman, p. 4). In addition, some communities have extensive informal parent network systems that can impact the effects of either positive or negative views of schools and schooling (Schneider, in Schneider & Coleman, 1993, p. 2). The town that is the site of the present study has extensive parent networks, mainly through its sports leagues. Parental perspectives and voices are clearly factors in school operations.

Early studies on parent involvement in schools examined the connections between the characteristics of the home and student success (Walberg & Marjoribanks, 1976, p. 527). Much of the later research on parent involvement has focused on the relationship of the family's demographic profile to the numbers and kinds of parents' activities in school. There is also a body of research that relates parent involvement in school activities to student achievement, particularly in regard to minorities and the disadvantaged (Schneider, in Schneider & Coleman, 1993, p. 4; Banks-Williams, 1991, p. 34). This research on parent involvement and its effects on student achievement is of limited interest to the present study for two reasons:

1. The present study focused on parent involvement for the purpose of program improvement rather than for gains in student achievement.
2. Research that is focused on minorities and the disadvantaged may not be applicable to the site of the present study because of the relative homogeneity of the school's population (which is described in the Site and Participants section of this work).

Several researchers have developed schemes of categories of parent involvement. Gordon (1979) describes four models of parent involvement in schools. The first of these is the parent impact model which aims to improve the capacity of the family to provide a positive learning environment in the home (p. 6). An example of this model is Head Start (p. 6). Second, Gordon's comprehensive services model seeks to provide health and counseling resources to ensure that children will be prepared to learn when they arrive at school (p. 6). The latter provides interagency communication so that needs are met but services are not duplicated. Increasing numbers of collaborative efforts among service providers in inner-cities have resulted in accounts of interagency partnerships and efforts to bring parents into the schools (Melaville & Blank, 1991, p. 13). This relates to the community impact model which focuses on the relationships of all of the components of the system and operates under the assumption that everything relates to everything else (Gordon, p. 9).

Gordon's school impact model is relevant to the present study because it stems from the assumption that student achievement will improve if schools respond to parents (pp. 7 & 8). This model measures educational improvement in terms of parent participation in the schools rather than on student achievement (p. 8). It encompasses parent involvement in the development of school programs, the focus of this study. A second scheme of parent involvement lists three types: parents as participants in their children's education, as school supporters and volunteers, and as participants in decision-making ("School is," 1987, pp. 2-5). The role of parents as decision-makers is of interest to the present study because the parents who participated in the study were engaged in an ongoing collaborative process for program improvement.

Davies (1987) mentions four kinds of involvement: coproduction or partnership such as home tutoring (p. 148), decision-making such as school improvement councils (p. 150), citizen advocacy such as a group that organizes specifically for support (p. 152), and parent choice[3] (p. 154). In Davies' model, the decision-making role relates to this study because it involved parents in a Project Improvement Team that worked to develop mutually acceptable agreements between parents and educators.

Delia-Dora (1979) provides a vision of parental roles that includes parents as helpers, resources, consultants (p. 67), and partners (p. 68). Legislation in California has dispelled the notion that schools belong to the educators (p. 69) by mandating that school districts must have secondary school site councils in which parents and students comprise half of the membership and elementary school site councils in which half of the council is comprised of parents (p. 68). Delia-Dora suggests that parents need to be involved in determining the purposes of curriculum as well as understanding the alternatives and consequences for the alternatives (p. 70). Furthermore, another recent study of parent involvement in school programs described parents as major stakeholders in the education of children. It reported parental influence on curriculum to be one of the major aspects of schooling affected by parent involvement, specifically in regard to education for cultural diversity (Griego Jones & Marti, 1994). This clearly supports the present study's efforts to bring parents into the process of developing a school program.

---

[3] Parent choice as a type of parent involvement is beyond the scope of this study and will not be addressed in detail because it often involves parents removing their children from public schools rather than working collaboratively to reach mutually acceptable agreements. However, the topic is one that is often linked to the content of the curriculum (O'Shea, 1979, p. 58). Therefore, it is important to realize that home/school collaboration can be a way of mitigating the impasses that lead parents to withdraw their children from the public schools.

Another researcher who has developed a scheme of parent involvement models is Epstein. Initially, Epstein (1987) described four types of parent involvement: basic obligations of parents, school-to-home communications, parent involvement at the school, and parent involvement in learning activities at home. Later, she added a fifth category, parent involvement in governance and advocacy. In Epstein's model, the last category is the one that is most pertinent to this study. It includes parents as decision-makers or advocates who work for school improvement (Epstein, 1988, p. 59), a model that is similar to that of Davies.

Recently, Epstein (1995) reformulated her scheme to include a sixth category for parent involvement. Her model now includes: parenting, learning at home, communicating, decision-making, volunteering, and collaborating with community (p. 704). She comments, "...certain practices are more likely than others to influence students' skills and scores, while others are more likely to affect attitudes and behaviors" (p. 707). This concept is of significance to this study because one of the primary goals of the school's science program is to foster positive attitudes about science.

Although this study focuses on parent involvement in school programs, a brief review of other types of parent involvement is necessary to establish a history of parent involvement in schools. The major portion of the literature on parent involvement deals with the engagement of parents in helping their children with their schoolwork (Schneider, 1993, in Schneider & Coleman, p. 4). For example, Goldenberg's (1989) case studies indicate that children whose parents helped them at home tended to be placed in higher reading groups (p. 329). The FIRST Grants Fund was established in 1989 to provide funding to local education agencies to train parents to work with their children at home. For example, Project PASS created partnerships of staff members, at-risk students, and their families to provide support services for the targeted students (Cross, LaPointe, & Jensen, 1991, p. 383). Similarly, the Institute for Responsive Education (IRE) actively develops school-home partnerships and encourages teachers and parents to share the responsibility for educating children. The IRE began with two schools and expanded into the League of Schools Reaching Out which encompasses 41 elementary and middle schools in 13 states and Puerto Rico (Davies, 1991, p. 377). It must be noted that much of this research on parent involvement and its relationship to student achievement has focused on young children, minorities, the disadvantaged or any combination of these. In contrast, the present study was situated in a middle school which was located in a middle class community with a homogeneous population, and the parent involvement effort was focused on resolving differences of opinion between parents and teachers rather than on improving student achievement.

There are also a number of parent involvement programs which have been developed for the purpose of improving home-school communication. The first, Chapter 1, is a program that uses three approaches to improve communication: face-to-face (conferences and home visits), technology (radio programs and videos on school issues), and written (newsletters) (D'Angelo & Adler, 1991, pp. 351-353). Similarly, Parents in Touch in Indianapolis has established a number of vehicles for home-school communication. These include conferences, homework hotlines, workshops and seminars for parents, and taped messages that can be accessed by telephone (Warner, 1991, pp. 372-375). The TransParent Model, a third example, involves parents, schools, and the local telephone company in a telecommunications effort which provides information to parents about the child's homework and classwork for the day. This project resulted in more than a six-fold increase in telephone calls to the school as well as improvements in homework completion and skill development (Bauch, 1989, 1990). Finally, Project FOCUS (Friendly Observations Can Unify a School) invited parents to be observers in classes for the purpose of improving school climate. This project was initiated by parents who asked to videotape a playground to prove that it was not properly supervised. The principal provided training in observation skills for the parents (Meadows, 1993).

In 1988, the National Education Longitudinal Study (NELS:88) produced a database of information on parent involvement that was collected from 26,000 eighth grade students, their parents, teachers, and school administrators (Schneider, in Schneider & Coleman, 1993, p. 7). Relying on self-administered questionnaires and tests, the study correlated student achievement over time with demographics, parental commitment to education, and home support (p. 8). The general conclusion of the study was that different racial or ethnic groups involve themselves in different ways in schools. For example, Asian-Americans are more likely to spend money on educationally-related activities (such as piano lessons) outside of the home, but are less apt to be involved in Parent-Teacher organizations (p. 11). This study also produced some data that are pertinent to the present study's mainly Caucasian school population. For example, at every grade level, whites more than any of the minorities talk more about school, a fact that is attributed to the likelihood that white parents and their children share a common understanding of school because they have had similar experiences with it (Muller & Kerbow, 1993, p. 18).

Another finding of NELS:88 was that white parents, more than parents in other ethnic groups in the United States, know more other parents, but that college-educated white parents had even greater numbers of contacts with other parents (Muller & Kerbow, 1993, p. 30). In other words, white parents were more sociable and had higher rates of parent friendships (p. 31). This is important data for the present study because of the parent networks that abound in the town. The largely white school population of this study interacts through a variety of parent networks that can work in either positive or negative ways regarding school programs. The presence of established parent networks can compound either positive or negative views in the community.

Parent involvement in early intervention efforts encompasses both the handicapped and disadvantaged populations. This type of parent involvement stems from the Head Start and handicapped Children's Early Intervention Programs which were founded approximately 30 years ago (White, Taylor, & Moss, 1992, p. 92). There are also a number of notable community collaboratives involving schools, parents, and community service agencies that have been established for the purpose of providing coordination and avoiding duplication of family intervention services. One of the most notable of these is California's New Beginnings (Payzant, 1992, p. 140) which was established to provide a community-wide network of services (Melaville & Blank, 1991, p. 13; Rodriguez, 1990). However, although these collaboratives actively involve parents, parents remain the recipients of services rather than being involved in problem resolutions (Melaville & Blank, p. 11).

There are other intervention approaches that go beyond providing services and try to empower parents to develop social capital that will enable them to assume responsibility. Coleman (1987) describes changes in families and work patterns in the last century and how the changes have resulted in the erosion of social capital. Until the end of the nineteenth century, the home was the site of the family's economic activity. Men, women, and children worked together to ensure the family's survival. The industrial revolution led first to the exodus of the men and then the women from the home (pp. 32, 33).

Coleman describes three types of capital:

1. financial--money or equipment that can buy or produce goods and services;
2. human--skills and knowledge that allow people to behave usefully;
3. social--relationships that establish a network and a system of credits

(Stone & Wehlage, 1992, p. 4). He believes that social capital is continuing to erode as mothers and fathers participate less and less in community youth organizations (Coleman, 1987, p. 37). A network of families that shares expectations will establish norms and sanctions that result in common bonds and loyalty (Stone & Wehlage, p. 5). Coleman believes that parent involvement in schools is a component in the building of social capital which is essential to the strengthening of both families and schools (p. 7).

One of the biggest obstacles in parent involvement programs is getting past the administrative viewpoint that inviting parents to participate in the development of school programs is the same as abdication of administrative responsibility (Hobson, 1979, p. 45). Williams (in Henerson, 1988) gathered perspectives of parent involvement from parents, teachers, administrators, school superintendents, and school board members. He found that there was general agreement that parent involvement leads to greater student success in school (p. 149), but that there was disagreement about the kinds of involvement that were appropriate. Principals and teachers felt most comfortable with traditional roles such as bake sales and attendance at school events (Chavkin & Williams, 1987, p. 180; Henerson, p. 149), but parents, school board members, and superintendents supported the notion of parents' sharing in decisions (Chavkin & Williams, p. 133; Henerson, p. 150). One related research review states that there are three general approaches to parent involvement: improving the parent-child relationship for the purpose of improving student achievement (Henerson, p. 150), parent involvement in the schools (such as training low-income parents to work with their children), and home-school partnerships (Henerson, p. 151). The general consensus of the reviewer was that higher achievement was most likely to occur if parents not only helped their children at home but also were involved in the school (Henerson, p. 151). Similarly, Comer's (1988) work in New Haven aimed to bring parents into the schools so that students could see them interacting in a positive way with faculty members (p. 445). With no changes in the socioeconomic status of the neighborhood, student achievement rose from 32 of 33 on standardized achievement tests to a tie for third out of 26 schools between 1968 and 1984 (p. 444).

There have been some efforts to involve parents in program development. Parent involvement for the purpose of strengthening the curriculum is a major goal of the education reform effort in California. Connecting parent involvement to student achievement, California's policy stresses the importance of parental advisement on school policies and programs (Solomon, 1991, pp. 360, 362). The California Department of Education is providing technical assistance to train staff to work with families (Chrispeels, 1991, p. 369). This is clearly an attempt to involve parents in decision making.

Similarly, the Title I program outlines a number of components of parent involvement. These include parent advisory councils to share in decision-making, volunteer corps for classroom support, parent awareness conferences for sharing the goals of the program, parent education, and home activities for students to improve skills (Hobson, 1979, p. 42).

The Chicago School Reform Act of 1988 attempted to involve parents in decision making by establishing Local School Councils (LSCs), each composed of six parents, two community representatives, two teachers, and the principal. The LSCs had authority over school budgets and improvement plans as well as the ability to hire or fire the principals. Although the Chicago Plan was struck down as unconstitutional, it is notable because it gave power and recognition to the parents (Center on Organization, 1992).

Another example of parent involvement was found in a school district where scientists, administrators, teachers, parents, students, and graduates worked together to evaluate their science program through visits to the schools, observations of science classes, questionnaires, interviews of parents, students, and staff, and student achievement tests and attitude scales (Utterback & Calin, 1989, pp. 49, 50). This assessment is unique in the literature because it represents a comprehensive and collaborative approach to evaluation.

The literature of parent involvement describes many approaches to engaging parents in schools, but it does not address the roles that parents can play in curriculum development. Furthermore, it does not suggest a process for including parents in the curriculum development/implementation process. Therefore, it was necessary to turn to the literature of school change in order to gain an understanding of processes that might be employed in involving parents.

School Change

The school change literature informed the present study in terms of the processes of change. In this regard, many school leaders have turned to the Total Quality Management business model for information on how to bring about change. They often find that the business model is difficult to apply to school settings because its language is of the business world (e.g., "customers" instead of "parents"). This makes it difficult for educators to understand and implement. However, this business language may be becoming more familiar to educators because it is beginning to appear in materials published by educational organizations. For example, a curriculum handbook published recently by the Association for Supervision and Curriculum Development contains a definition of curriculum which foresees "...a vision of curriculum which serves as a bridge rather than as a barrier to suggest roles for practitioners that are result-driven and customer-oriented" (Curriculum Handbook (1994), p. 236). Therefore, although many educators have been trained in TQM, they struggle to apply its principles in school settings. To date, most applications have been reported in terms of school business processes such as finance. The present study extended this knowledge base by applying TQM principles to school program development.

Some school change leaders have addressed the issue of parent involvement in schools. Among these are Roland Barth and Michael Fullan. Barth envisions a school as a "community of leaders" (Barth, 1988, p. 129) where "...students, parents, teachers, and principals all become school leaders in some ways and at some times" (p. 131). This vision is one of shared decisions and responsibilities in which everyone contributes to the whole. While Barth does not articulate types of parent involvement, it is clear that he sees parents as active participants in schools.

Fullan is more explicit about the importance of parent involvement. He categorizes parent involvement into four roles:

- parent involvement at school (e.g., volunteers)
- parent involvement in home learning activities (e.g., tutoring)
- home/community collaboration

- governance (e.g., advisory councils) (Fullan & Stiegelbauer, 1991, pp. 229-238).

Fullan believes that parents identify with activities that relate directly to their own children and that educational reform is dependent on the combined efforts of families and schools (p. 250). He also cites many studies that connect parent involvement in home learning activities with improvements in student achievement (pp. 229-237), but his primary focus is on school or system improvement rather than on the achievement of individual children (p. 228).

Fullan also describes eight lessons of this new change paradigm. Included are several that are especially pertinent to this study:

- Change is a journey, not a blueprint (p. 24).
- Problems are our friends (p. 25).
- Connection with the wider environment is critical for success (p. 38).
- Every person is a change agent (Fullan, p. 39).

He also cites a study that lists conditions for whole school curriculum development:

- working toward shared institutional values
- organizational structures
- resources: commitment, time, people, materials
- leadership (attributed to Nias et al., p. 65).

Educators who are interested in school change have tended to focus on children and teachers rather than on the system. However, school leaders in the town that is the site of this study have been working with the principles of Total Quality Management (TQM) for over five years. Therefore, the first focus of this school change literature review is on TQM and its application to schools.

The literature indicates that the TQM business model in educational settings has been used mainly to guide school administrative and communication issues (Marchese, 1991; Miller, 1991; Needham, 1992; Seymour, 1991). Registration, maintenance, and payroll procedures have been improved by using the TQM model (Cross, 1993, p. 16). A recent survey of Pennsylvania schools showed that educators have some knowledge of TQM, but that there has been little implementation of the continuous improvement principles that are at its core (Reynaud, 1993).

However, researchers at the University of Wisconsin have developed a TQM-based student/teacher team approach to improving classroom teaching practices. Student evaluations are collected early each semester and are used by professors to alter the pace and organization of lectures as well as making adjustments in such matters as the size of the lettering on transparencies that are used in class (Seymour & Chaffee, 1992, p. 28). This represents a shift in the focus of assessment from accountability to quality improvement and extends the responsibility for quality to the students as well as the professor (p. 27). This involvement of students in giving feedback for instructional improvement has obvious implications for curriculum improvement efforts in K-12 schools.

Glatthorn (1994) applies the concept of systemic planning to school curriculum development in his recent book, Developing a Quality Curriculum. He begins with curriculum planning at the district level and continues to the school and classroom levels. This approach is valuable for establishing constancy of purpose and continuity in a district.

Beyond Glatthorn's outline for systemic curriculum planning, I contend that there is no literature that specifically applies the continuous improvement principles of TQM to the development of specific school curricula. This belief is supported by the author of a recent dissertation from Pennsylvania State University who states that there is little, if any research on the application of continuous improvement processes to American education (Regauld, 1993, p. 2). It is beyond the scope of this study to speculate about reasons why the Quality process has not been used in this regard except for two brief comments. First, educators have been examining the Quality process for only the past few years. Originally a corporate model, the process was widely accepted in Japan where it transformed the management of the Japanese automobile industry. It was not until American businessmen recognized that changes were needed if they were to compete with the Japanese that the Quality process was identified as a major factor in Japanese success.

A second reason that the Quality process has only recently been viewed favorably by educators may be that it was originally viewed in terms of a production model which could only be applied to business. However, parallels between the Quality process and constructivist approaches to teaching can align the Quality process with constructivism rather than the social efficiency movement. While TQM stresses the importance of data collection and measurement, it also emphasizes the importance of empowerment, involvement, and shared responsibility, concepts that are similarly espoused by constructionists.

The focus of the present study was on continuous improvement, a key principle of the Quality process. In this regard, there are a number of theorists from both the corporate and educational worlds who agree that this principle is essential to school reform efforts.

Deming (1986) outlined 14 principles of corporate management. Principle number five states, "Improve constantly and forever the system of production and service" (p. 49). The present study focused on this principle as it applied to the science program at the district's middle school, specifically, that the science curriculum would evolve and improve continuously with input from the students and parents who are the school's customers.

In the pursuit of continuous improvement, Deming stresses the needs of the customer. He states, "The consumer is the most important part of the production line. Quality should be aimed at the needs of the consumer, present and future" (p. 5). Students are viewed as having dual roles as workers

(Bonstingl, 1992a, p. 67) and customers (Olson, 1992, p. 26). The sole role of the parents is that of primary customers. Accordingly, student and parental needs must be met or exceeded. It is, therefore, appropriate that the opinions of students and parents be sought in order to meet their needs.

Deming also emphasizes the importance of data gathering and suggests a series of visual aids for interpreting what is in place and developing plans for improvement (Walton, 1986, p. 7; Walton, 1991). This study's survey, focus groups, and structured interviews provided means for systemic data collection. Analysis and organization of data incorporated the use of Quality tools.

Deming's continuous improvement principle is supported by other Americans who have led businesses to adopt aspects of the Quality process. These include Joseph Juran, Philip Crosby, and William Conway. Juran (1989) is well known for the Juran Trilogy, an approach to change that includes identifying the customers and their needs as well as determining ways to meet those needs (p. 20). The institute that bears his name is dedicated to training and support in the areas of Quality processes and tools (Quality Improvement Tools). Crosby also connects customer needs to improvement efforts. His approach to Quality emphasizes corrective action (Cornesky, McCool, Byrnes, & Weber, 1991, pp. 39-42; Crosby, 1984, pp. 101, 106, 115, 112) while his definition of Quality is "conformance to requirements" (p. 59). Conway (1992) combines the thinking of Juran and Crosby; he stresses the need for continuous improvement, meeting of customer requirements, and the importance of data collection and analysis (pp. 45, 53). He speaks of "value-added work, that which adds value in the eyes of the customer" (p. 9). Value-added work may be defined as efforts to satisfy a customer's requirements.

One other person who has impacted the Quality process is Imai (1986). His belief system rests on Kaizen (p. 5), the continuous improvement mindset that pervades the lives of many Japanese. He believes that management has the responsibility for both maintaining and improving standards (p. 6). Continuous improvement is, therefore, common to the theories of Deming, Juran, Crosby, Conway, and Imai. They are all important to this study because of their insistence on continuous improvement as well as their recognition that the needs of customers must be met.

In the world of education, Bonstingl has been instrumental in two important ways: interpreting the business world language that Deming employs and citing specific applications of Deming's principles to schools. The addition of Bonstingl's thinking to Deming's theories provides a powerful basis for applying Deming's principles to school settings. Bonstingl (1992) believes that the essence of the Quality process in schools is the continuous improvement of teachers' and students' work together (p. 77). Teamwork--among students, between students and teachers, as well as between teachers and administrators--is essential. Bonstingl has asked, "Why don't we emphasize going back and talking...? What worked for them? What didn't?" (Willis, 1993, p. 4). He advocates using student responses to such questions to improve learning.

Like Deming, Bonstingl (1992c) believes in data collection and communicating statistical information as a basis for change efforts. He suggests numerous ways to organize school data, one of which is the affinity diagram that is useful for data analysis (pp. 63-68; Quality Improvement Tools). This Quality Tool was used as both the vehicle for organizing survey responses in the present study and also as a preliminary tool in the data analysis that was undertaken by the members of the Project Improvement Team.

While Bonstingl has applied the Quality business model to school issues, others have developed Quality theories specifically for education. Probably the best known of these is Glasser whose theories enhance and support those of Deming. Glasser insists that schools provide a non-coercive and collaborative atmosphere, one that stresses mutual respect.

Quality, according to Glasser (1992), is "the best that everyone in the organization, working both separately and together, can achieve at any particular time" (pp. 177, 178). Clearly, as needs change, today's quality must evolve in order to be a future quality. Continuous improvement is essential.

Glasser (1986) identifies five basic human needs: to survive and reproduce, to belong and love, to gain power, to be free and to have fun (p. 23). He also believes that every person is driven to satisfy his basic human needs (Glasser, 1990, p. 13). The focus groups and Project Improvement Team employed strategies that offered opportunities for participants to satisfy several of these needs: belonging--being part of a group; power--understanding that one's opinions are respected; fun--the collegial atmosphere that was prevailed throughout the focus group and Project Improvement Team meetings. In a sense, freedom was also inherent in the parent involvement process because parents participated openly in the shaping of the science program.

Some educators believe that student work must be designed to meet student needs. For example, Phil Schlecty, president of the Center for Leadership in School Reform states, "Our first business is to invent schoolwork that engages and keeps the kids" (cited in Olson, 1992c, p. 26). Glasser's (1992) view agrees but is stated in the language of the Quality process: "Working hard will not satisfy our need for power when we are engaged in doing what we believe is a low-quality task: Busy work, for example, is the epitome of low-quality schoolwork" (p. 89).

Researchers have asked students, "Where in school do you feel important?" Student responses indicate that they feel valued when participating in drama or musical productions and sports because these activities allow them to work together and help each other, thereby adding a social dimension to their work. Therefore, extracurricular activities which include fun, sociability and freedom may be used as models for ways to empower students within the classroom setting (Glasser, 1990, p. 432; Glasser, 1992, pp. 47, 89). NAEP surveys have shown that students have very negative attitudes about science

(Yager & Penick, 1987, p. 93); it is important to begin efforts to improve in this area.

This study, therefore, was based on the Continuous Improvement principle of the Quality process. It involved parents in identifying aspects of science program that needed improvement. Data collected in the study were used to shape plans for the curricular revisions that were made during the Summer of 1995 and enabled the teachers to direct their energies in ways that were most likely to satisfy the needs of the students.

Rudyard Kipling said, "The strength of the wolf is in the pack" (Gray, 1993, p. 370). Both schools and industry are moving from dictatorial to participative styles, from an emphasis on instruction to an emphasis on learning (Betts, 1992, p. 41), from elitism and alienation to mutual respect (Gray, 1993, p. 373), from competition to cooperation (Holt, 1993, p. 383). It is clear that Quality Management is gaining adherents at all levels in the American educational system. The American Association of School Administrators established a Total Quality Network in 1991 which already has over 300 members; the National Alliance of Business has also become involved in applying Quality Management principles to schools (Olson, 1992a, p. 27). There is, therefore, growing evidence indicating that applying the Quality process to school improvement efforts is an effective approach to school reform.

Science Education Reform

The content and teaching of science programs are changing in order to bring science education into alignment with the times. The changes are difficult for parents to understand because students of today are experiencing science classes that are very different from those that their parents attended. It is necessary to review the literature of the science education reform movement in order to understand this paradigm shift. It is also important to note that the science education reform literature does not address the role of parents in the movement. The present study contributed to the knowledge base in this area.

Within the past five years, there has been a major shift in the way that educators approach the writing of science curricula. Both the American Association for the Advancement of Science (AAAS) and the National Science Teachers Association (NSTA) have suggested that educators replace traditional textbook-centered curricula with locally developed programs which may be continuously improved as new content and teaching strategies become known. The basic reason for this paradigm shift lies in the phenomenal growth in scientific knowledge which has occurred since the turn of the century. There are now approximately 30,000 recognized research fields. In addition, there are over 70,000 journals of which 29,000 are new since 1978 (Hurd, 1991, p. 33). Science and technology have, in many cases, merged. For example, scientists discovered the laser, but technologists developed practical uses for it: surgical tools, laser disks, digital communications equipment. There has also been a blurring of the lines between the disciplines. Today, very few scientists work totally within one field.

However, within science education, the old boundaries still exist. The United States is the only industrialized country to use the "layer cake" approach (Aldridge, 1992, p. 9) which was established in 1893 by the National Education Association (NEA). It originally provided that separate subjects be taught at each grade level: physical geography, biology, physics, and chemistry. This was later changed to physical geography, biology, chemistry, physics (Brunkhorst, 1991, p. 36). While the world of research is currently driven more and more by societal needs such as the AIDS epidemic and the search for new energy sources, many educators have continued to present outmoded course content that is isolated from human experiences and is useless outside of the classroom. While researchers overlap fields of science and technology and tie social, economic, educational and human issues to everyday life, many science educators have not integrated the natural sciences with mathematics, the social and behavioral sciences, or the humanities (Hurd, 1991, p. 35) but continue to teach students to think as isolated researchers. The world of science no longer functions in this manner (p. 33).

Science educators must continually rewrite curricula in order to prepare students for the ever-changing world. In the decade of the 1980s, classroom practices that were considered innovative when they introduced hands-on experiences 20 years previously were replaced with outdated textbook approaches of the prior generation that stressed factual knowledge (Besvinick, 1988, p. 52). This regression was due, in large part, to the focus on accountability and on state and national tests which stress quantity of information learned rather than higher order thinking skills and in-depth understanding.

An ongoing controversy in science education has centered on the value of a textbook approach. Research is unclear on the adequacy of science textbooks. In America, some studies have indicated that over 90 percent of science teachers use texts and consider them to be adequate, but conflicting testimony indicates that evaluators consider the majority of textbooks to be inadequate in both content and usability. In either case, most middle level textbooks follow the old layer-cake pattern of life, physical, and earth science for the three middle school years. Texts and teacher lectures continue to be dominant factors in science education (Bybee, Buchwald, Crissman, Heil, Kuerbis, Matsumoto, & McInerney, 1990, pp. 101, 102). The National Science Foundation recommends that textbooks be used only as sources of information (Yager & Muther, 1986, p. 86). As long ago as 1951, James Bryant Conant stated,

> The stumbling way in which even the ablest of the scientists of every generation have had to fight through thickets of erroneous observations, misleading generalizations, inadequate formulations, and unconscious prejudice is rarely appreciated by those who obtain their scientific knowledge from textbooks. (Aldridge, 1992, p. 19)

For many years, educators have believed that science is best learned through an experiential approach. Paul DeHart Hurd, Professor Emeritus at Stanford University, estimates that fewer than 5% of American teachers are teaching inquiry-based science in classrooms today (Bachofer, Carstens, Fischer-Garza, & Devitt, 1990, p. 2). Perhaps the clearest metaphor on this subject is attributed to Henri Poincare who stated, "Science is constructed of facts, as a house is constructed of stones. But a collection of facts is no more a science than a heap of stones is a house" (Bachofer et al., p. 2).

Officials of the federal government have recognized that education in science must change. The United States Department of Education (USDE) is funding a project of the National Academy of Sciences to oversee the setting of national standards in science (West, 1992d, p. 12). These national standards were made public in the latter part of 1994 (p. 12). The USDE has also established grants for local and state departments of education to provide inservice training and fellowship opportunities for teachers. Similarly, the National Science Foundation (NSF) recognizes that many science teachers are poorly prepared and has, therefore, offered grants aimed at staff development. Other NSF grants are available for the development of advanced instructional technology that discourages accumulation of factual knowledge (Knapp, Stearns, St. John, & Zucker, 1988, pp. 678, 680).

In addition, there are two other major national reform efforts that are focused on science curriculum, teaching, and assessment. Both aim to de-emphasize rote memorization and recitation of facts. The National Science

Teacher's Association (NSTA) developed Scope, Sequence, and Coordination (SS&C) while the American Association for the Advancement of Science (AAAS) funded Project 2061. The latter contains an evaluation component that was a major influence on the National Academy of Sciences in developing its national standards (West, 1992c, p. 1).

The focus of these science education reform efforts has been to provide integration of the natural, behavioral, and social sciences with mathematics and technology while connecting the sciences to the humanities and to the real world. Proponents of the reform efforts agree that students must be trained to think critically about how science and technology can change society (Roth, 1989, p. 220). There is also general agreement that in order to accomplish this task, changes must be made in content, teaching strategies, and evaluative methods.

Some of the innovations that follow are included in programs that are currently being developed or are already in place in schools around the country. The two most comprehensive, Scope, Sequence and Coordination and Project 2061, offer many ideas for consideration, but these other programs also bear consideration.

For example, one elementary school science program, the Mid-California Science Improvement Program (MCSIP), has established science as the "ingredient that unites all other subjects" (Greene, 1991, p. 43): math, language arts, fine arts, social studies. Teachers have traditionally had difficulty incorporating science into interdisciplinary units because some science concepts are abstract. By developing science units with an eye to interdisciplinary work, not only can science become the focus for the unit, but also the content is forced to start with the concrete before moving to the abstract. This is consistent with the needs of adolescents who are at a stage of development where some are beginning to be capable of abstract reasoning while others are still operating within a concrete framework.

Another relevant concept in science education is the organization of curricula around conceptual themes such as systems, scale, change, and diversity (Bybee et al., 1990, p. 42). An alternative set of conceptual themes includes: cause and effect, change and conservation, diversity and variation, energy and matter, evolution and equilibrium, models and theories, probability and prediction, structure and function, systems and interaction, time and scale (pp. 42-47, 54). It is easier to draw connections to other areas of study if content is organized in this manner.

Wiggins (1987) postulates that "less is more," that students who become involved with and practice ideas will truly understand them (p. 10). However, many teachers continue to operate under the old philosophy that students must be stuffed with as many facts as possible and rely heavily on textbooks that are written in a similar vein. Wiggins also believes that students must be presented with thought-provoking curricula that encourage them to think by offering unsettling material that has no one right answer. Such materials encourage students to question and search for knowledge.

Similarly, researchers working under Scope, Sequence, and Coordination developed The Content Core. Under this project, each educational center uses The Content Core as the basis for writing its own curriculum according to its specific needs. SS&C also advocates teaching fewer topics to allow for more in-depth understanding. Recognizing that the United States is one of the few industrialized nations that organize science curricula into isolated disciplines, thereby not providing for students to see the connections between the disciplines and world concerns, SS&C recommends that the four major science disciplines be taught each year. Furthermore, SS&C discourages homogeneous grouping for science which tends to isolate the more able students by tracking them into accelerated classes and also filtering out the rest of the students. SS&C proposes that hands-on activities come first, vocabulary, symbols, and equations later, and that there be no reliance on textbooks (since American publishers do not offer "integrated" texts). The grade sequence for SS&C would have seventh and eighth grade students taking two periods of biology each week, one each of chemistry, physics, and earth science (Scope, sequence..., 1992, pp. 2-4).

The Content Core is not a curriculum but takes the subject matter of science education and organizes it so that educators can write their own curricula. It provides a list of topics and subtopics that form the basis of the scientific knowledge that a student must acquire by the end of high school.

SS&C insists that all four disciplines be taught every year for grades 6-12 and that the disciplines be integrated as much as possible (Scope, sequence..., p. 7). It agrees with the Project 2061 statement that "less is more" and is compatible with that project in every way (p. 9). It also opposes the traditional "layer-cake" approach of one discipline per year. Seventy-five percent of American students do not take science after tenth grade which is traditionally the year that biology is offered. Therefore, many are never exposed to either the physical or behavioral sciences (p. 14).

The "scope" of SS&C is grades 6-12; "sequence" refers to ordering the content so that students start with the concrete and move to increasingly abstract concepts over a period of several years; "coordination" is the integration of biology, chemistry, earth/space science and physics and their relation to the rest of learning (p. 15). A course can be organized around a single focus such as "great ideas"--evolution and energy; "phenomena"--space exploration; distribution and consumption of food; "science, technology and society"--automobile travel and environmental quality (pp. 19-23). Alternatively, courses may be organized around disciplines and taught in parallel (one or two periods each week in each discipline with activities coordinated around one topic such as light) or in series (each discipline taught for one quarter of the school year) (p. 24). Performance-based assessments are an integral part of SS&C programs (p. 29) because courses that are based on inquiry and activities cannot be assessed by traditional fact-based tests.

As an example, SS&C suggests three thematically organized sequences for grades 6-12 in biology. The first, Living Organism, includes systems and cycles. Biological Planet encompasses components, interactions, and patterns, while Properties of Living Things is comprised of structures unique to life, interaction with the environment, reproduction, and composition (pp. 39-40). The SS&C sequences for chemistry, earth/space science and physics are organized so that their subtopics are easily integrated with these.

One high school in Los Angeles has restructured its science courses around the SS&C recommendations. Freshmen and sophomores now take integrated science courses that are heterogeneously grouped and begin with direct experiences and progress to symbols and terminology. One topic is "Patterns of Change" and connects concepts from biology, chemistry, earth science and physics to the real world of the student (Brunkhorst, 1991, p. 36).

The basic premise of Scope, Sequence and Coordination is that "...science is needed by everyone and everyone is capable of learning and enjoying science" (Aldridge, 1992, p. 10). Concepts are presented experientially before vocabulary is introduced. This ensures that the learner experience terms in their various contexts before terms are taught (p. 11). In this way, the student moves from the concrete to the abstract. The Content Core suggests a spiralling sequence in which concepts are studied at increasingly abstract levels as students progress in school (p. 12).

The SS&C reform effort is based on solid research bases. As an example, arranging learning in a spiralling progression stems from studies of the spacing effect, the belief that spaced presentations result in better learning in any given period of time than is possible by teaching large blocks of information (Dempster, 1992, p. 25). Studies on ability grouping support the belief that ability grouping is ineffective in all subjects (Slavin, 1992, p. 63). Research on cooperative learning suggests that this strategy increases academic achievement, improves self-esteem, and encourages social growth (Manning & Lucking, 1992, p. 74). Therefore, both the content and the teaching strategies of SS&C are backed by studies that support the Content Core (Aldridge).

The other major effort, Project 2061, is funded by the Carnegie Foundation of New York and the Andrew Mellon Foundation. It recommends that science curricula contain less content but have greater depth. It also suggests that boundaries between the disciplines be softened, connections between the disciplines be emphasized, thinking skills be stressed and memorization be decreased (Crane, 1991, p. 39). Also included are learning goals for all American students (Rutherford & Ahlgren, 1988, p. 75) and the suggestion that schools teach less but teach it better (p. 3; Science for all Americans, 1989; Update Project 2061, 1992).

Project 2061 is in three phases. The first outlines the knowledge, skills and attitudes students should acquire during each grade from kindergarten through grade 12. The second will develop curriculum models for schools to use. The third will use the results of the first two phases to reform science education (Rutherford & Ahlgren, 1989, p. 4). The content will not be different from what is traditionally offered, but "boundaries between traditional subject-matter categories are softened and connections are emphasized" (p. 55). Also, the students will no longer focus on details but will be encouraged to think rather than memorize (p. 55).

Project 2061 emphasizes the importance of setting "benchmarks," expressions of learning outcomes (what students can do at specified points in their school years), focusing in this case on grades 2, 5, 8 and 12. This is a departure from the National Assessment for Educational Programs (NAEP) practice of using grades 4, 8 and 12 for testing) (Update Project 2061, p. 18). This project is, therefore, taking a lead in establishing standards. It also recognizes that the best curricula are written by those who teach the children in a particular location and are, therefore, familiar with the details that are meaningful for a particular learning situation (Rutherford & Ahlgren, 1988, p.79). Locally developed curricula have the added advantage of more commitment to their use by the teachers who become invested in the materials they prepare (West, 1992c, p. 11). It also suggests that learning goals be organized around concepts rather than around topics so that connections may be readily drawn (Rutherford & Ahlgren, 1988, p. 79). In this regard, Project 2061 is similar to SS&C.

Project 2061 also suggests that local school district curriculum committees include suggested teaching techniques in order to facilitate learning. Teachers are encouraged to begin with familiar and concrete phenomena and move to the abstract, i.e., observe, collect, handle, describe, ask questions, try to find answers, vocabulary to follow (Rutherford & Ahlgren, 1988, p. 81). Content must be presented so that it is relative to all sciences and technologies: chemistry, psychology, computers, etc. Mathematics should be avoided when it interferes with the learning of science concepts (p. 82). Also, there should be crossovers between the sciences and the humanities (p. 84) as well as human affairs such as agriculture, medicine and transportation (p. 87).

Project 2061 has established five general goals that will help curriculum writers to develop curricula that stretch beyond the outdated factually based science programs. These stress the importance of educating for different purposes:

- Knowledge - What should educated people know?
- Human Meaning - Who are we? Where are we going?
- Work and Productivity - How can we prepare for the job market?
- Social Responsibility - How can we prepare students to be informed participants in society?
- Childhood Enrichment - Can we help students to gain satisfaction with their lives? (Rutherford & Ahlgren, 1988, pp. 88-89)

Another consideration in science education reform is the inclusion of skill development activities to encourage progression to higher order thinking.

These might include: observing, communicating, comparing, ordering, categorizing, relating, inferring, applying (Crane, 1991, p. 41).

The "5-E" model of the Biological Sciences Curriculum Study (BSCS) is yet one more secondary curriculum model:

1. Engagement: Activities designed to engage students with an event or question; teacher helps students make connections with what they know and can do.
2. Exploration: Students work cooperatively to explore ideas through hands-on activities.
3. Explanation: Students explain their understanding of concepts.
4. Elaboration: Students participate in activities that guide them to apply what they have learned.
5. Evaluation: Students assess their own knowledge, skills, abilities.

Teachers evaluate student progress through activities (Estes, 1990, p. 688). This model clearly describes standards that involve more than rote memorization of facts.

In addition, the National Center for Improving Science Education (NCISE) has proposed a plan for developing high school science curricula. This plan emphasizes that the curriculum must empower all students with a working knowledge of science concepts and that it must be structured around a core of learning that will lead to an "in-depth engagement with science" over four years. The proposal also suggests that all students should take a two-year series of core courses followed by two more years of specialized courses in one of three alternative strands for those bound for college, technical or engineering school or the job market. All students would, therefore, take four years of high school science, but the last two years would be geared to the future plans of the individual student. Therefore, the focus of science education is on providing a general science education for all students rather than on only a college preparatory route for a few. This is consistent with research for middle school students as well. The NCISE believes that the present programs in the lower grades are inadequate even for the college-bound. The proposal for these students recommends heterogeneous groups as well as a focus on contemporary, social, civic and personal issues (West, 1992b, p. 4).

Similarly, the National Science Foundation (NSF) recommends Science/Technology/Society (STS), a program that uses local issues, questions and problems as starting points and gets students involved in exploring and formulating explanations or solutions to problems. Rustum Roy, Director of the NSF, believes that STS is the "science education megatrend" (Yager, 1988, p. 53; Yager & Muther, 1986, p. 85).

One way to organize a science curriculum project was reported by a Los Angeles High School that developed an integrated program. The teachers examined the content of their curriculum, determined themes that were appropriate for each grade level, organized the content into a spiralling curriculum for grades 7-12, then shared materials, laboratory plans and other materials (Brunkhorst, 1991, pp. 37, 38) Experienced teachers have many ideas on how to teach; they are able to draw from their shared and diverse experiences in developing curricula.

The National Center for Improving Science Education states that adolescents prefer physical and mental involvement over passive learning and find learning most interesting when it relates to their immediate concerns, questions and goals. Therefore, scientific concepts and processes for middle school students are best presented in a personal and social context (Bybee et al., 1990, p. 5).

Science assessment should be performance-based, emphasizing what students can do rather than whether or not they have taken or passed a course (Crane, 1991, p. 39). In this regard, students should be asked to demonstrate what they have learned rather than merely answering questions. Instruction and assessment can be intertwined so that they overlap and become indistinguishable from each other (Darling-Hammond, Ancess, & Fall, 1995, p. 3). Most traditional testing instruments for science are efficient (i.e., short answer and easy to grade) but offer very limited information on science achievement. Changing the way achievement is measured is a powerful factor in the reform of science education (Shavelson, Carey, & Webb, 1990, p. 693).

Portfolio assessments add a dimension to evaluation that is overlooked by short-answer tests which do not show the depth of science education. They should include a variety of items and be collected throughout the school year

(Collins, 1991, pp. 293, 296). Such assessments offer students and teachers opportunities to see progress throughout the year and may be examined by teachers in subsequent grades to determine needs for future instruction. The Quality Model stresses that students must evaluate the quality of the work they are asked to do as well as the quality of their own performances beginning as early as first grade (Glasser, 1992, p. 98). The quality process focuses on statistical analyses to determine customer satisfaction as well as on decision-making techniques to enable workers to improve (Olson, 1992b, p. 8).

There are obvious consistencies between the recommendations of the science reform efforts that have been described above. These include:

- emphasis on hands-on activities
- concrete experiences preceding abstract concepts
- "Less is more"
- the importance of providing scientific literacy for all (rather than the elite)
- a need to rethink assessment strategies
- the value of cooperative learning activities and heterogeneous grouping
- the relevance of providing integrated learning opportunities.

There is a body of research that has sought to identify qualities that make work meaningful and enjoyable for students. The National Center for Improving Science Education suggests that adolescents prefer physical and mental involvement over passive learning and find learning most interesting when it relates to their immediate concerns, questions and goals. Therefore, scientific concepts and processes for middle school students are best presented in a personal and social context (Bybee et al., 1990, p. 5). Research has shown that 13-year-olds generally have not grasped the connections between scientific principles and the problems of society when science has been taught as an isolated subject (Bowers, 1991, p. 5). It is important that students be able to relate their classwork to the world around them (p. 6; Vogel, 1991, p. 1). This is, in a sense, another type of integration, that of school experiences with the world of the students. Adolescents are very focused on themselves, their peers, and the present. Therefore, connecting learning to these topics sparks interest. In this regard, the characteristics and needs for middle level science programs are consistent with those that have been identified for ideal middle schools (Bybee et al., 1990, p. 24).

This review of the literature of science education reform described current thinking in the field. It is conspicuous in that there is one obvious omission--the roles of parents in the reform movement. The present study attempted to fill that gap.

Summary

This review of the literature examined three separate but related bodies of theory and research: parent involvement, school change, and science education reform. Each informed a different aspect of the present study, both by supplying information that could guide the study and also by indicating where the present study could add to the knowledge base.

Parent involvement was the focus of the present study. Parents, in TQM terms, are the customers of public school educators. If one accepts this premise, their perspectives must be respected, and educators must collaborate with them in order to establish mutual agreements in regard to programs. The review of parent involvement literature established that there has been little effort to involve parents in program development and that there is disagreement among the constituencies of school communities about what areas should be open to parent input. This helped to inform the need and appropriateness of this study.

The review of the literature on school change emphasized the principles that provided the structure for a systems management approach to school improvement in this study. These concepts are important because they provided the framework, principles, and organizational approaches that drove the process of involving parents in the program. This body of literature provided several notions that became the basis of the process of this study. First, involving all major stakeholders, in this study, the parents, for the purpose of enlisting their support. Second, using Quality tools to expedite the organization and analysis of data. Third, employing the concept of continuous improvement to meet the needs of the parents.

The final portion of the literature review was an examination of the science education reform research. This knowledge base informed Tier I of the study, the work of the parents and teachers who worked together to improve the science program by providing the research that supported the philosophy and practices of the school's science program: hands-on activities, connections to other science disciplines as well as other subjects and the real world, etc. While the reform movement emphasizes the importance of engaging teachers in the process of developing curricula locally and makes references to parent involvement, I was unable to locate resources that described specific efforts to engage parents in program development.

Chapter III

METHODOLOGY

Introduction

This chapter presents the methodology of the study and begins with a description of the Context of the Study. This section includes Background Information which provides an understanding of the development phase of the school's science program which preceded this study. A description of the study's location and population is included under the subheading, Site and Participants.

The Research Design of the study follows. It is unusual in that it has two distinct levels which I have called Tiers I and II. Tier I, the work of a Project Improvement Team composed of parents and teachers, focuses on a school project, the improvement of the school's science program. This became the vehicle for Tier II, developing a process for engaging parents in the improvement process and conducting educational research in parent involvement. The chapter concludes with an examination of concerns about the study: its limitations and validity as well as efforts to control for biases.

Context of the Study

Background Information

District Influences

The science program that is central to this study was developed by the school's science teachers who approached the task of developing a science program by looking first to the district's Success-Oriented School Model (Figure 1). This framework had been developed previously by local educators and is accepted as the basis for all change efforts in the district. They placed basic needs at the foundation of this model in the belief that they drive all human behavior. It follows that in order to satisfy these needs, school leaders must examine what they believe, want, and know in order to plan all actions leading to the goals that are taught (Process Skills, Cognitive Achievement, Self-Directed Learning) as well as those goals which are recognized as essential to learning but are not directly taught (Self Esteem, Living and Working with Others). In developing the model, the town's educators developed a shared belief that the district's mission, "All children can and will learn well," may be fulfilled through the attainment of all five goals.

The curriculum development process that preceded the present study involved Middle School staff and students in the development and implementation of the school's science program (Figure 2). Initially, the

Figure 1

Success-Oriented School Model

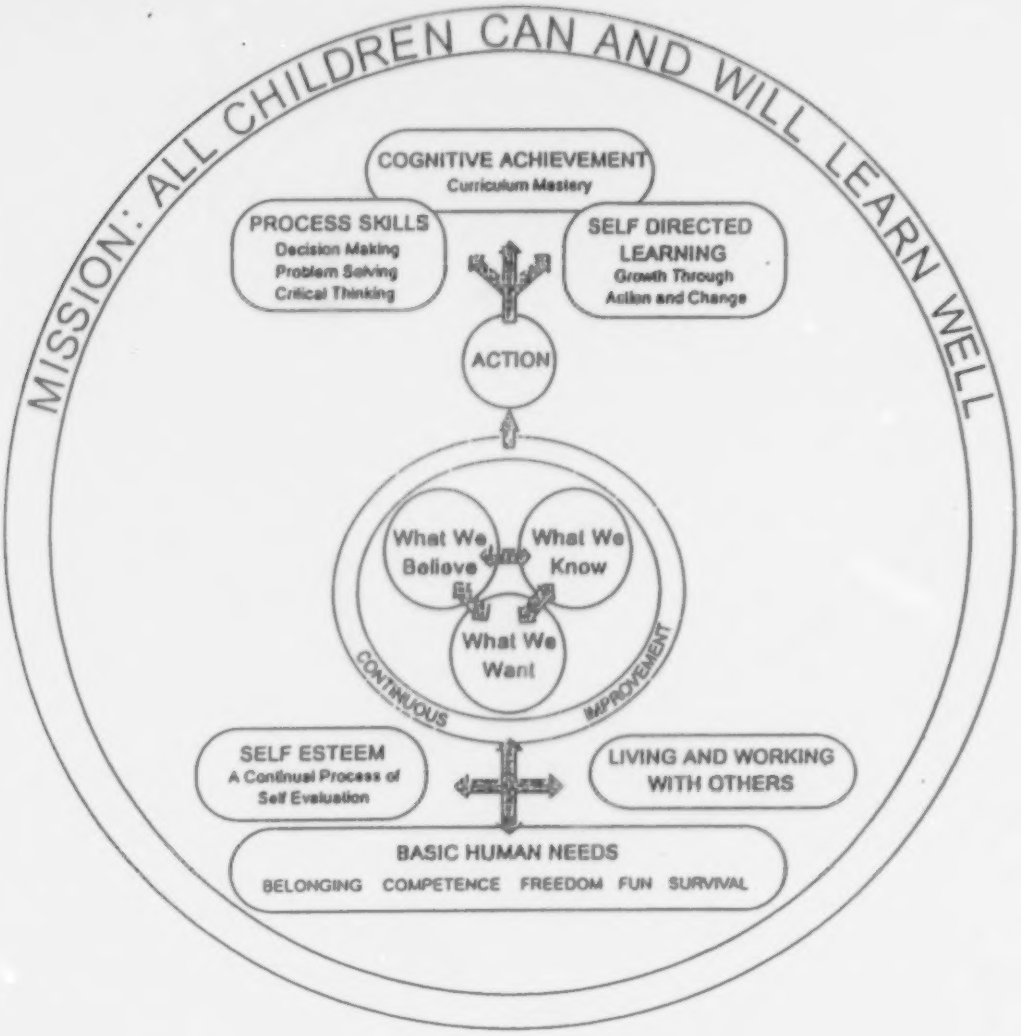
MISSION: ALL CHILDREN CAN AND WILL LEARN WELL
COGNITIVE ACHIEVEMENT
Curriculum Mastery
PROCESS SKILLS
Decision Making
Problem Solving
Critical Thinking
SELF DIRECTED LEARNING
Growth Through Action and Change
ACTION
What We Believe
What We Know
What We Want
CONTINUOUS IMPROVEMENT
SELF ESTEEM
A Continual Process of Self Evaluation
LIVING AND WORKING WITH OTHERS
BASIC HUMAN NEEDS
BELONGING COMPETENCE FREEDOM FUN SURVIVAL

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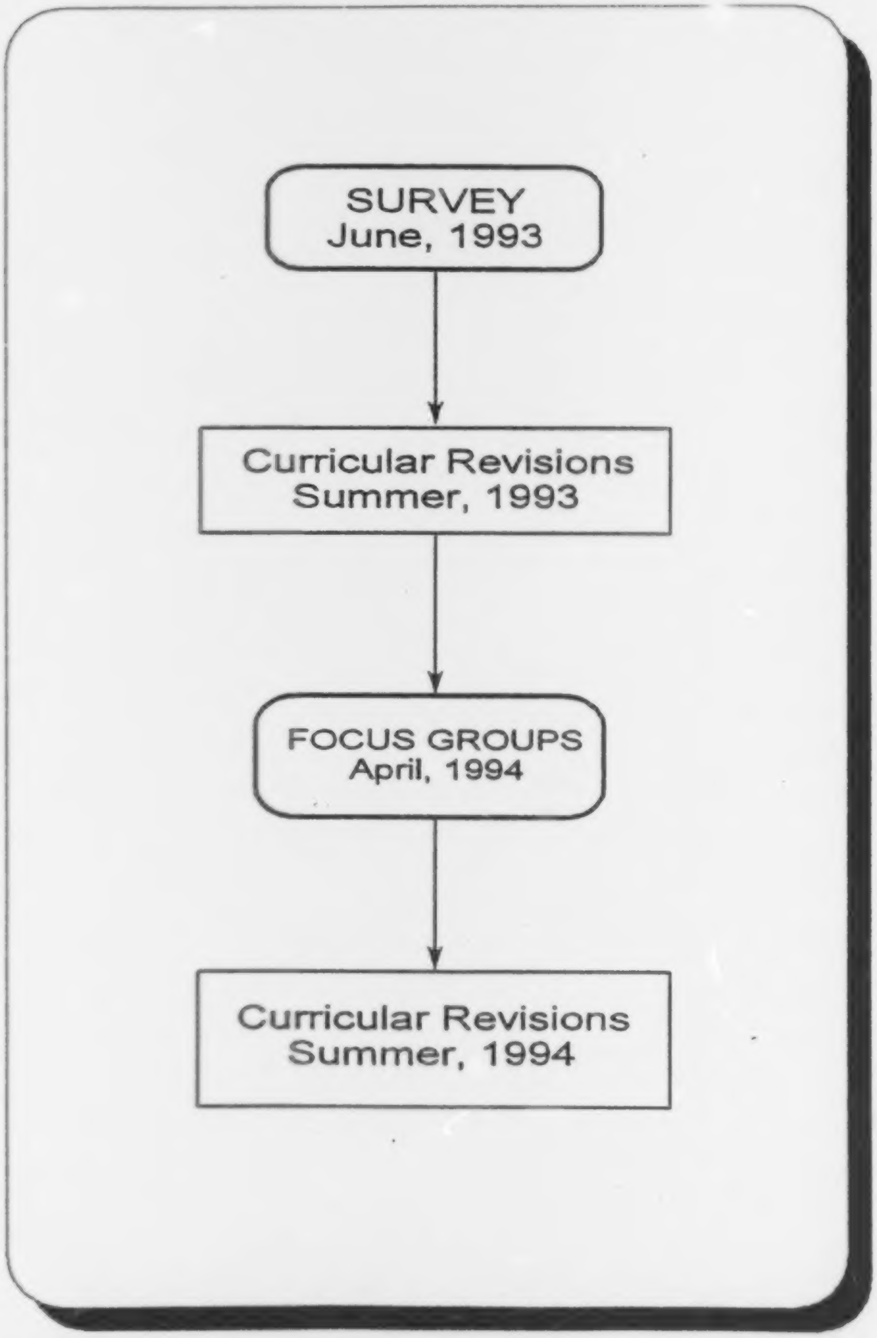
Figure 2

Diagram of Prior Research


SURVEY
June, 1993
Curricular Revisions
Summer, 1993
FOCUS GROUPS
April, 1994
Curricular Revisions
Summer, 1994

curriculum writers turned to the district's Success-Oriented School Model for direction on where to begin. They focused on the model's foundation and brainstormed ways that the curriculum might be revised to satisfy the basic human needs of students. For example, if one believes that it is essential that students experience fun and a sense of belonging in school, then it follows that cooperative learning activities might be one means for students to satisfy this need.

The curriculum writers devoted many hours to determining what they wanted in a new science program, what they believed about science education, and what they knew, both from their own experiences as science teachers and also from the literature of science reform. They analyzed all of these data in order to determine the parameters of their new program, settled on a format for writing, and began the tasks of developing essential questions and objectives as well as locating multiple resources for content, activities, and assessment. The new curriculum was implemented in grades six, seven, and eight in September of 1992.

Prior to this study, educators at the school developed collaborative channels for the purpose of continuously improving practices at the school. The school's Governance Council, composed of staff members and parents, has several subcommittees which are called Project Improvement Teams. These had effected changes in the school's schedule, discipline policy/procedures, and other matters of importance to parents and staff. It was natural for the science curriculum writing team to follow this model and adopt a collaborative approach to their task.

Student Participation

Recognizing that students were a source of information about the program's strengths and weaknesses and that they could be brought into the collaborative process, at the end of the 1992-93 school year (the first year the program was implemented), a student survey was conducted at the school. Data indicated that there was a need to reexamine the types of homework assignments that were included in the curriculum. The curriculum writers focused on this issue during their ensuing summer work session with the intent of improving this area of the curriculum in order to meet the needs of the students. The following year, several student focus groups were convened in order to collect in-depth data from the students regarding their perceptions of the science program. Again, the curriculum writers addressed student concerns in their summer work.

I worked with other staff members to develop the student questionnaire, organized and analyzed the data myself, and facilitated all of the student focus groups. I remember being impressed with the seriousness of the students as well as the depth of their responses. At the end of one session, I asked students for their opinions about the focus groups. One memorable comment was from an eighth grade boy who said, "Before today, I never thought that anyone in this building cared what I thought." The following day, I received a telephone call to the same effect from his mother. While the student focus groups had been conducted solely for the purpose of gathering information about a school program and were not part of a formal educational research project, they raised my awareness of their potential value for both enhancing self-esteem and involving participants. They were, therefore, important to the present study because they led me to ponder the importance of involving other members of the school community in program development. My running of the student focus groups had obvious implications for the present study, and ultimately, my previous efforts to achieve the involvement and support of students led me to believe that engagement of all major stakeholders is essential to school improvement efforts.

Paralleling these efforts to involve students in curriculum development, I became aware of rumblings in the community indicating that not all parents were totally satisfied with the new program. This led me to the realization that parents were a missing voice in the "collaboration for continuous improvement" cycle that had been established at the school and that the collaboration that began with the teachers and later included students needed to be extended to parents. Later, I saw that the school project of involving parents in improving the science program also offered an opportunity for educational research that could add to the knowledge base regarding parent involvement in the development of school programs.

Site and Participants

The school that is the site of the present study is located in a southern New England community of approximately 20,000 people. The town is within Fairfield County and is classified as an emerging suburban area.

The population of the town is racially homogeneous; over 95 percent of the students are white. Economically, there is more diversity. Approximately 4 percent of students qualify for free or reduced lunches; some are obviously affluent and live in large homes on three to five acre lots. However, the recent recession affected almost everyone. Many parents who previously worked as middle or upper level managers lost their jobs and struggle to maintain their large mortgage payments and former lifestyles. The past two years showed a swing in the economic pendulum, hopefully an indication of the beginning of a recovery from the recession. This is substantiated by the fact that each of the district's last two budgets passed at its first referendum, something that had not happened for several years. Furthermore, there are a number of new houses under construction, many in the $500,000 range.

The school has virtually all of the features that are valued in exemplary middle schools: small communities for learning, flexible scheduling with blocks of time, teams of teachers, a school governance council, a commitment to shared decision-making, support from and links with community organizations, health and social service supports (Hamburg, 1990, pp. 6-11). There are either three or four interdisciplinary clusters (teams) at each grade level at the school.

Parents are clearly a major factor in the operation of the schools, and their involvement is actively sought. Although 80 percent of graduating seniors go on to college or other post-secondary schools, parental educational expectations vary. Some families aspire to send their children to highly competitive schools, but others demonstrate attitudes that are more laissez-faire. Many parents are genuinely interested and involved in the schools. The school's Parent Teacher Association is an important component of the school community and offers a parent perspective on many school issues. Parent representatives are active in the school's Governance Council as well as virtually every school committee: student recognition, cultural arts, and others. In general, parents are interested and visible in the schools.

The district's educators and many of its parents have been trained in Total Quality Management which stresses the importance of focusing on the needs of the parents. Therefore, in recent years there have been several attempts to gather parent input via surveys and focus groups. All have been met with substantial responses. The district, has, therefore, a history of involving parents in schools which provides a firm basis for this study of parent involvement.

Research Design

This study was an outgrowth of my interest and commitment to the district's mission and efforts to engage members of the school, my involvement with the development of the school's science program, and my efforts to involve students in curriculum improvement. The study represents a merging of a school-based action plan which focuses on the science program with an educational research project on parent involvement (Figure 3).

The study's research design was planned in two phases which I have called Tiers I and II. Tier I was the work of the parents and teachers on a Project Improvement Team. Its data sources included parent and teacher surveys as well as parent focus groups that I conducted prior to the first meeting of the Project Improvement Team for Team members to use in the early stages of their work. The analysis of these data was done by the members of the Team in the first phase of their work to improve the science program.

The research question that I had eliminated early in the study provided the basis for the early work of members of the Project Improvement Team. This question was worded: What insights can parents and teachers contribute to curriculum development? It included three subquestions.

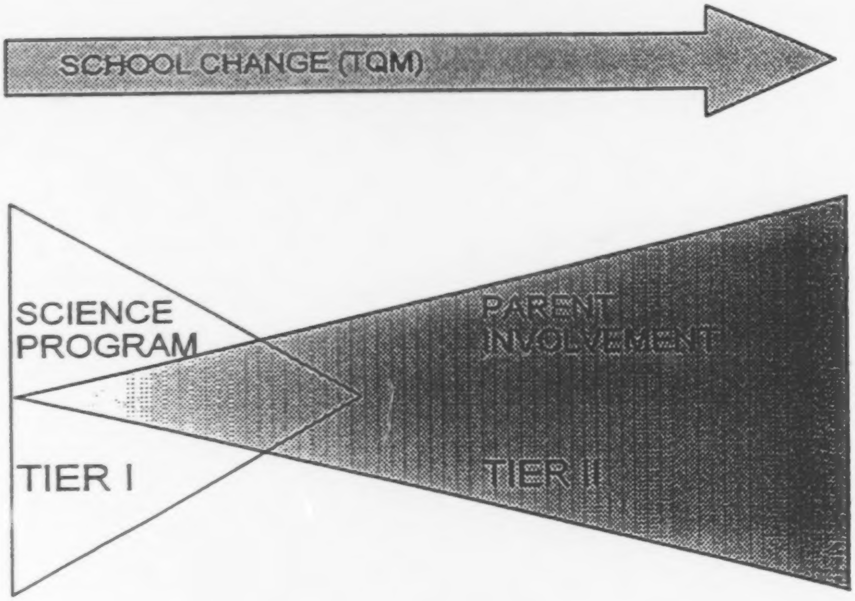
A. What do parents perceive to be the strengths and weaknesses of the program, and what variations exist within the parent group?

B. What do teachers perceive to be the strengths and weaknesses of the program, and what variations exist within the teacher group?

C. How do parent perspectives compare and contrast with those of the teachers?

Figure 3

Merging of School-Based and Educational Research Projects


SCHOOL CHANGE (TQM)
SCIENCE PROGRAM
TIER I
PARENT INVOLVEMENT
TIER II

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The members of the Team used the data from the parent and teacher surveys and the parent focus groups to answer subquestions A and B. These data provided the basis for answering C. The process of analyzing this data provided a means for authentically involving the parents in curriculum development.

Tier II examined the process of parent involvement in the science program. Its data sources included the transcripts of the meetings of the Project Improvement Team, the transcripts of the individual interviews of the members of the Team, and my researcher's journal. I analyzed the data that these sources provided in my attempt to understand ways to involve parents, the roles they would assume, and procedures that could be used to engage them.

Tier II attempted to answer my research questions:

- What happens when parents and teachers seek to collaborate in the reform of the science program?
- What procedures can be used to involve parents in curriculum development?

My researcher's journal (Appendix W) as well as the transcripts of the audiotapes of the focus groups, meetings of the Project Improvement Team, and individual interviews provided descriptions of what happens when parents and teachers sought to collaborate in the reform of the science program. Data were gathered both directly by asking questions of participants through the surveys, focus groups, and individual interviews and indirectly through observations which I recorded in my journal.

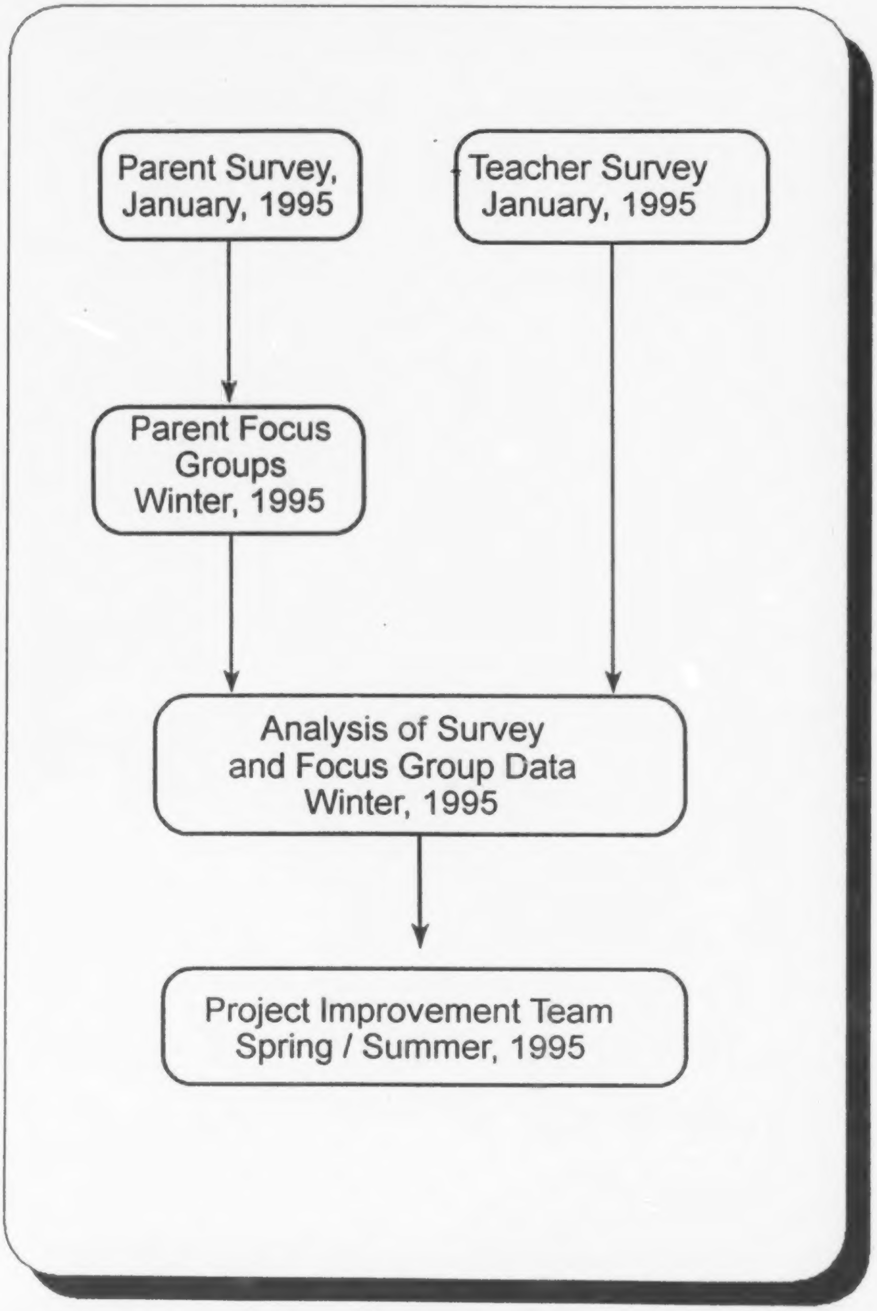
In general, I approached the procedural question through trial and error. First, I familiarized myself with Quality processes and tools and selected those that seemed to be appropriate as the study progressed. For example, as I was transcribing the audiotape of the second meeting of the Project Improvement Team, I noticed that Team members were starting to reach consensus on concerns because certain themes were recurring. Accordingly, I prepared a draft of an Affinity Diagram to show the relationships of the emerging ideas (Researcher's Journal--April 20, 1995; Project Improvement Team--April 27, 1995). Also, prior to the last meeting of the Team, I prepared a planning matrix as a large wall chart so that all participants could become actively involved in the decisions that would be made at the meeting (Researcher's Journal--May 11, 1995).

Tier I--The Work of the Project Improvement Team

My overall plan for Tier I was to engage parents and teachers in a series of involvement activities that would focus on the improvement of the school's science program. These included: surveys, focus groups, and membership on a Project Improvement Team. In this process, the numbers of parents participating decreased as the levels of commitment, time, and involvement increased.

Figure 4

Plan for Involving Parents in Science Program


Parent Survey,
January, 1995
Teacher Survey
January, 1995
Parent Focus
Groups
Winter, 1995
Analysis of Survey
and Focus Group Data
Winter, 1995
Project Improvement Team
Spring / Summer, 1995

This study included a preset plan and procedures for involving parents in the development of the school's science program (Figure 4). This represented a departure from the traditional image of qualitative research which espouses emergent design and discourages prestructuring (Miles & Huberman, 1994, p. 17). However, some educational theorists believe that there is value in having a plan in mind before research begins. For example, Wolcott states that while he sees merit in open-mindedness to enter a research setting looking for questions as well as answers, he adds that it is "...impossible to embark upon research without some idea of what one is looking for and foolish not to make that quest explicit" (cited in Miles & Huberman, 1994, p. 17). I chose Wolcott's approach because I believed that prestructuring would set one path for the research, a path that I was prepared to alter if I saw indications that other paths would be more appropriate.

Pilot Study

The study was informed by my previous experiences with surveys and focus groups. I piloted the questionnaires that were used in this study in order to determine if the questions were understandable to parents and teachers and if the format was user-friendly. The parent questionnaire was piloted with a sample of eight Middle School staff members who were also parents of students at the school. None of these parents was a science teacher. I personally delivered drafts of the cover letter and questionnaire to each of these parents and explained my need to determine the clarity of the questions and the format. I also asked them to return the questionnaires to me in person.

All who were asked to participate agreed to do so. When respondents delivered their completed questionnaires, I asked them several questions. These included (summaries of responses after each question):

1. How long did it take? (about five minutes--7; fifteen minutes--1)
2. Were the questions understandable? (yes--8)
3. Can the format be improved?

   (Clarify "content" and "skill development" in question 16--1)
4. Are there any questions that should be added or revised? (no--8)

These responses indicated that question 16 needed clarifying. A phrase was inserted before the survey was administered.

Responses to the closed questions were tallied (Appendix D). Because the number of responses was small, I used different colors of ink to differentiate responses for the demographic categories that were represented within the sample. This portion of the instrument indicated that there was general agreement with all of the statements, but that two parents had concerns about the availability of reading resources and two about science projects. In addition, one believed that review materials were inadequate.

One qualitative piece of information that I was able to note because the pilot questionnaires were returned to me in person was that the "disagree" comments all came from two staff members who have sixth grade daughters. The daughters were in different sixth grade teams, but the parents worked together. Their answers raised several questions: Were their responses a reflection of their obvious opportunity to network with each other? Was there something unique about the sixth grade in general or about the teaching in their teams? (A third sixth grade parent answered all questions affirmatively.) Were their responses an indication of the fact that their children were new at the school and had not had time to adjust to the new approaches of its science curriculum? Were their responses gender related? Do girls prefer textbook learning, boys hands-on? These questions were indicative of those that I anticipated would be generated by the survey and that I hoped to clarify in focus groups.

Responses to the demographic questions showed that the respondents' children represented all five of the public and parochial elementary schools that are located within the district but that none had attended an out-of-district school in grade five. The three grade levels were represented (grade 6 - 3, grade 7 - 3, grade 8 - 2). Therefore, the pilot study respondents represented the full spectrum as far as school of origin and present grade level.

However, all eight of the respondents' children had received grades that were in either the A or B range, and six responded that their child's attitude about science had improved, while two said that it had stayed the same. I surmised that these data might reflect the fact that all of the respondents worked within the school (four as secretaries, four as teachers) which could have the effect of keeping them focused on their children's achievements. The high grades of their children might be a reflection of the respondents' involvement with their children's schooling in terms of supporting homework, reviewing at home for tests, picking up work when children were absent, etc. However, they might also be representative of the school as a whole because the school's honor role regularly includes a large percentage of the students at the school.

The question asking parents to identify components of an exemplary science program showed the following:

1. laboratory or hands-on - 8
2. projects - 4
3. lectures - 2
4. computer technology - 6
5. interdisciplinary connections - 3
6. emphasis on content - 6
7. emphasis on skill development - 4
8. developing positive attitudes about science - 7

These responses indicated that parents value hands-on experiences, but that they also recognized a need for an informational content base. They also saw a need to foster positive attitudes about science and to include technology. This information would be confirmed or negated by the final survey and focus group discussions.

In response to the question inviting respondents to participate in a focus group, two answered affirmatively, six negatively. If this pattern had continued in the final survey, I might have expected approximately 225 parents to be willing to attend focus groups, potentially 20 sessions. I was prepared to hold these if responses warranted them. However, I believed that the response from the parent community would not produce such a large number of responses because the questionnaires would not be collected in person as were those of the pilot. I also believed that without the personal contact, it would be likely that some parents would neglect to complete the survey. This would reduce the percentage of those who would volunteer to participate in focus groups.

The responses to the demographic questions made me aware that I needed to explore a computerized sorting system so that data could be sorted easily for each demographic question (school of origin, grade level, etc.). I found that my method of coding data with colored inks on the pilot questionnaires was both tedious and confusing. It also did not provide for easy sorting. It was essential for me to develop a process that was both faster and more efficient in order to handle the large number of responses that I anticipated from the survey.

Parents of students at all three grade levels responded to the open-ended questions. The two sixth grade parents who were discussed earlier both indicated their beliefs that a textbook was needed. One also mentioned a concern with projects but included a comment that this was because she felt her child did more than her share of the work. I surmised from this comment that the response might be indicative of a concern with cooperative learning rather than with projects. Seventh grade parents indicated a need (for grade six only) for more hands-on, and possibly more lectures in grade seven. Grade eight comments supported the program's focus on hands-on but raised questions regarding a need for more equipment (such as balances) in order to allow more opportunities for individuals to be involved. There were also positive responses regarding improved attitudes, greater student interest and involvement in science, the availability of research opportunities in the library, and the CPR unit in grade seven.

Concurrently, the teacher questionnaire was piloted with the school's science coordinator. I selected the coordinator for this pilot because I felt a need to preserve the collaborative climate of the science department at the school by keeping him informed and involved; I anticipated that he would share his experiences with the study with other members of his department. His responses showed that he believed the program to be strong in all areas except one--availability of ample sources of information. His open-ended responses indicated needs to provide more reading opportunities such as periodicals in the library and computers with modems in every classroom so that students could access America On-Line and other similar resources. He checked off all of the items that were listed under components of an exemplary science program which indicated that he supported the basic philosophy of the new program. This was not surprising since he had been involved in the program from its inception.

He also inserted a comment regarding parent participation in curriculum development indicating his opinion that it was appropriate "...to a point--this could get out of control if not monitored closely." I questioned whether this was an indication that the school's teachers might be apprehensive about parent involvement in school programs.

This pilot, therefore, indicated that the questionnaires were user-friendly in terms of the respondents, but that the use of a computerized spreadsheet would greatly reduce my work in sorting data into demographic categories. The piloting of the questionnaires served one other important purpose. It indicated that the time for me to begin my journal entries was immediately. My contacts with respondents to the questionnaires provided glimpses into their attitudes about both the science program and the process of parent involvement. Therefore, my researcher's journal entries began when the questionnaires were distributed in January, 1995.

Descriptions of Data Sources

I began data collection by sending questionnaires to both parents and teachers. I chose to send questionnaires in the belief that these instruments have a high degree of content validity because they measure what they are intended to measure (Hopkins, 1989, p. 54). However, my prior experience with the student survey had raised my awareness to the fact that survey instruments by themselves often raise unexpected questions. Therefore, my plan also included provision for follow-up parent focus groups to clarify and enhance the survey data.

The goals of both the surveys and focus groups were to gather information on parent and teacher perspectives about the science program and to provide a means for involving the parents in the science program. They also raised the question of whether the parents and teachers believed that it was appropriate for parents to be involved in the development of school programs.

Parent Survey. I developed a draft of the parent questionnaire and then enlisted the help of several of the science teachers at the school to refine it (Appendix B). Its goal was to determine parents' perspectives of the science program, and it included both closed- and open-ended questions. My previous experiences with questionnaires had raised my awareness that such instruments can often raise more questions that they answer. Therefore, I included open-ended questions that provided opportunities for respondents to clarify and enlarge on the short responses.

The closed questions served two functions: to focus parents on aspects of the science curriculum that the researcher believed to be of concern, and to provide a means for comparison to a teacher questionnaire. Only two of the questions were not specific to the content and teaching methods of the science curriculum. One asked parents if they agreed or disagreed that the science curriculum was exemplary, another if parent participation in curriculum development projects was appropriate. These were included to establish some baseline data for achieving the purpose of this study, increasing the knowledge base regarding parent involvement in the development of school programs by examining the school's efforts to promote parent participation and involvement in the reform of its science program. I also included several demographic questions to determine if respondents represented a cross-section of the parents at the school.

The open-ended questions served three functions: adding depth and clarification to the closed question responses, providing a means for respondents to share information about their views regarding the science program in categories that were not covered in the closed questions, and giving respondents opportunities to convey emotions (Patton, 1987, p. 11) that could not be elicited in the closed responses. These questions established the basis for the focus group interviews that were to follow.

Teacher Survey. The questions on the questionnaire for teachers were identical to those of the parents except that it did not ask for demographic data (Appendix C). The wording was changed slightly in some questions to make it appropriate for teachers (e.g., "your student" instead of "your child").

Parent Focus Groups. The focus groups involved parents in a more personal way and provided an opportunity for me to collect clarifying data regarding the science program and also to observe the behaviors and interactions of parents in a focus group setting. Furthermore, the focus groups introduced participants to the concept of the Project Improvement Team.

Focus groups can add a deeper understanding of survey data. Therefore, the study incorporated parent focus groups in order to ensure that parental concerns would be thoroughly understood and that adequate opportunities to examine the process of involving parents in the development of the school's science program would be available.

Topics to guide the focus group discussions were based on the program areas which showed the highest levels of concern in the parent survey data: reading/review materials, projects, hands-on/laboratory experiences, consistency/equity, attitudes of male versus female students, and parent involvement. For example, parent responses to the survey indicated a concern about projects. Therefore, one focus group question was, "What insights can you contribute to the projects your child has done in science?" However, unlike the focus group questions that were used in the 1994 student focus groups, more open-ended questions were included so that parents would not be restricted in their answers. Specific focus group questions (Appendix F) were not shared with participants in advance in order to ensure spontaneous responses.

One science teacher attended each of the focus group sessions and contributed to the study by encouraging parents to add details to their comments, thereby enriching the data. She encouraged in-depth discussion by asking additional probing questions that stemmed from her day-to-day classroom experiences.

Procedures

Parent Survey. The purpose of the survey, the right to either sign the survey form or remain anonymous, and the roles of the participants were explained in the cover letter (Appendix A) that accompanied the survey. The letter informed parents that participating in the survey would serve as an indication of informed consent.

The parent questionnaire was distributed to the parents of all of the 888 students in the school. Questionnaires (Appendix B) and cover letters were distributed on January 6, 1995. Students were told to take these home in their Friday folders, ask their parents to respond, and return the forms to the school on Monday, January 9. My instructions requested that homeroom teachers return the forms each day to my office with the morning attendance report.

I collated the data in order to determine parent perspectives of the strengths and weaknesses of the science program. Data summary sheets were used for the scoring of the closed questions of the survey. An enlarged copy of the questionnaire served as a tally sheet for this purpose. I calculated both the numbers and percentages of responses to the short answer questions in order to determine general areas of parental concerns. Those questions with the largest numbers of total answers in the disagree categories were reformulated as the lead questions for focus groups. I anticipated that a true cross-section of parents responding was unlikely to occur as a result of this sampling strategy because I believed that parents with concerns would be more likely to respond. I also expected that respondents were likely to be parents who were focused on academics and might, therefore, be the parents of high achievers in the school.

The form provided directions for folding and stapling to ensure confidentiality of results. An added incentive to encourage participation was that the cover letter contained a statement promising that data from the survey would be published in the school newsletter.

Ultimately, all survey data were entered into the computer using the Paradox database program which produced the raw data. Percentages of responses were calculated using Quattro. Short answer data were sorted into five demographic categories using an Oracle relational database management system, and Quattro was used for calculating percentages. Thirteen data tables were prepared showing parent responses, teacher responses, comparisons of parent and teacher responses, and parent responses in each demographic category (Researcher's Journal--February 19, 1995).

A different sorting system was needed for the responses to the open-ended questions because of the volume and complexity of the data. The open-ended responses were color-coded by running the printouts of the data on assorted colors of paper, one for each demographic category. Responses were then separated by cutting them apart, hand sorting and mounting them onto large (2' X 3') sheets of oaktag. This was a very time-consuming process, but the hand-sorting provided a means for categories to emerge from the data.

It resulted in ten large charts (Researcher's Journal--February 19, 1995).

I reported the survey data in a number of different ways: actual numbers of responses and percentages in each of the five categories (strongly agree, agree, no opinion, disagree, strongly disagree) and actual numbers and percentages after compressing both the strongly agree/agree and disagree/strongly disagree categories to provide a total of three categories (agree, no opinion, disagree). This gave me a picture of areas of strongest responses as well as a general sense of parental and teacher concerns with aspects of the science program.

In addition, I sorted the survey data into categories that corresponded to the five demographic questions in order to determine differences in responses that might be inherent in the makeup of the respondents. For example, the piloting of the questionnaire indicated that the greatest concern regarding the absence of a formal textbook came from the parents of sixth grade girls. Was this due to the parents' gender, the children's grade levels, or to the fact that the respondents (their mothers) worked in the same office and might have influenced each other's responses by discussing their answers? (Following the pilot, I added a question that would allow me to determine genders of the children of the respondents.)

All data tables and charts were set aside for analysis by members of the Project Improvement Team. My transcriptions of the audiotapes of the focus group sessions were also analyzed by the members of the Team. The decision to leave the task of analyzing survey and focus group data to the Project Improvement Team was based on my assumption that this process would be a means to build the Team, increase ownership of the continuous improvement project, and promote greater understanding of the data (Researcher's Journal--March 5, 1995). This assumption is supported by Deming's fourteenth principle, "Put everyone in the organization to work to produce the transformation" (Deming, 1986, p. 24).

Teacher Survey. I personally distributed the questionnaires to all eleven of the school's science teachers, explained its purpose, and asked the teachers to return the forms to my office.

Parent Focus Groups. Seventy-three parents initially volunteered to attend focus groups, but only 37 actually participated. Even though participants in focus groups were selected from the respondents to the questionnaire and, therefore, had been informed via the cover letter that accompanied the survey's questionnaire, participation in a focus group was reconfirmed via both a telephone call from the researcher and follow-up letters (Appendix E).

I piloted the focus group questions informally with the same group of teachers and parents who piloted the questionnaire. I also invited the participants in this pilot to share suggestions for additional questions; they did not request either changes or new questions.

I knew that focus groups are used frequently in industry in order to determine customer needs. Their strength lies in their organization--an informal gathering of people who discuss a specific topic for a predetermined period of time. For this study, focus groups provided both a means of clarifying and expanding the survey data and an opportunity to observe parents as they participated in the development of the school's science program.

Patton (1987) suggests that focus groups developed in response to the recognition that consumer decisions are often made in social contexts and grow out of conversational situations (p. 135). I believed that parents who could share their perceptions with their peers would be able to develop their thoughts and contribute deeper insights than those that were collected via questionnaire.

Focus groups were arranged at mutually convenient times with all parents who indicated interest on the survey. Sessions were offered at varied times (8:00 a.m.; 1:00, 4:00, and 8:00 p.m.) to accommodate parent schedules. Meetings were limited to 60 minutes and were scheduled as close together as possible to ensure that responses in each group would be as spontaneous as possible (Appendix G).

The focus groups met in the faculty workroom at the times that were mutually convenient for the parents and myself. The room was arranged so that parents and the researcher sat in a circle. Refreshments and name tags were provided to establish a collegial and comfortable atmosphere (Appendix G). I facilitated all of the focus group sessions and also served as the recorder.

I attempted to control sources of error that might have affected reliability of the data collected during both the focus groups and the individual interviews that took place later in the study. These included: fluctuations in mood or alertness of respondents, variations in testing conditions, differences in scoring or interpretation of results, and the effects of those who fill in questionnaires without thinking about their responses (Henerson, Morris, & Fitz-Gibbon, 1987, p. 147). Fluctuations in mood, alertness, and testing conditions were minimized by providing similar settings for participants. These included using the same room for all focus groups and offering food and beverage (Appendix G).

Collecting of data during the focus groups was done in two ways--by recording responses on flip charts and audiotaping. Prior to the meeting of each group, a flip chart was prepared with separate sheets for each focus group question. The sheets were posted in the faculty workroom and taped so that each question was hidden. Questions were uncovered one at a time during the session. All parent responses were recorded on the sheets and coded with the first names of the respondents. I believed this method of recording data to be valuable for a number of reasons. First, it is validating to the participants to see their responses recorded. It also offers an immediate data source that is reliable. This reason was confirmed when the audiotape failed during one of the focus group sessions (Researcher's Journal--March 12, 1995). Furthermore, the flip chart offered an opportunity for respondents to reflect on what had been said and to revise it as needed. The audiotapes and flip charts served as back-ups for each other. Audiotaping was achieved by recording on a portable recorder. Dictation equipment facilitated the process of transcription. The notes that resulted from combining the information from the flip chart with that of the tapes is in the Appendices (Appendix T).

After parent responses to questions were recorded on the flip chart sheets, questions and responses were reviewed. The parents and I asked spontaneous questions of each other to clarify, elaborate, and expand the content of the original parent responses. Contributions to this portion of the discussion were recorded in a different color on the flip charts. All data were subsequently entered into a computer where it was coded and sorted. Data from all of the surveys and focus groups were organized by category into a document that represented a giant Affinity Diagram, a Quality tool that helps to organize quantities of data (Bonstingl, 1992b; Brassard, 1989). These data were analyzed by members of the Project Improvement Team.

Observations regarding the process of interactions were recorded immediately after each session in my journal. One observation that I had noted during my previous focus groups with students was that it appeared that whatever the first respondent said, others were apt to support. However, this was not true of the parent focus groups (Researcher's Journal--February 25, 1995). Furthermore, some students had to be drawn into the focus group discussions. In the parent groups, only one participant failed to contribute. When I asked her later if there was a reason she had been so quiet during the focus group, the parent responded that she had been amazed at how many of the parents had science backgrounds and how much they had to say. She added that she had felt somewhat overwhelmed because she did not have such a background (Researcher's Journal--March 12, 1995). Subsequent to the last focus group, I also noted that I felt that although every focus group session had different dynamics, with the exception of this one parent, every person contributed to the discussions (Researcher's Journal--March 12, 1995). Follow-up letters were sent to all focus group participants (Appendix H).

Data Analysis

Patton (1987) stated, "There is typically not a precise point at which data collection ends and analysis begins"; he added, "The overlapping of data collection and analysis improves both the quality of the data collected and the analysis so long as the evaluator is careful not to allow initial interpretations to bias additional data collection" (p. 144). My experiences with the data of this study support these notions.

The Project Improvement Team began its work by examining the data that was compiled by me from the parent and teacher surveys and the parent focus groups. At its initial meeting, I presented an overview of the history of the science program and distributed folders of information to each of the participants. These included a list of the names of all participants, a copy of the original parent survey, a 15-page synopsis of the focus group data, 13 tables of data from the parent and teacher questionnaires, the data from the open-ended questions of the teacher questionnaires, and a few sheets of lined paper (Researcher's Journal--March 26, 1995). The data from the open-ended questions from the parent surveys were arranged on a total of 10 large charts (sheets of oaktag, each two feet by three feet), two for each of the five demographic questions. When I asked for volunteers to analyze the large charts, six of the parents quickly responded. Ultimately, five parents did this analysis, each taking the charts of Concerns as well as Needs and Reasons for each of the five demographic categories. The members of the Team reviewed the data and selected issues that needed to be addressed. They then prioritized the issues, developed an action plan to address them, and considered ways to communicate the Team's work to the rest of the parents at the school.

Surveys. I tallied all survey results in order to avoid differences in the scoring or interpretation of the data to the open-ended questions. I also coded the data as suggested by Strauss and Corbin: collecting the data, reviewing it line by line, noting categories or labels beside paragraphs, periodically reviewing the categories, noting the emergence of slightly more abstract categories that encompassed others (cited in Miles & Huberman, 1994, p. 58). I had intended to enlist the assistance of one of the science teachers at the school for the purpose of check-coding, a process that suggests that if researchers code separately and review their codings together, sharper definitions and greater reliability will result (p. 64). However, the task of sorting the responses to the open-ended questions proved to be so time-consuming that I decided it would be an imposition to make such a request. Instead, I presented the data as I had sorted it to the members of the Project Improvement Team and invited them to reorganize it if they saw alternative connections.

However, I collected a large amount of survey and focus group data that pertained specifically to aspects of the science program at the school which I organized into 13 data tables (Appendices K and L) and 10 charts that I described previously. I also transcribed the audiotapes of the meetings of the focus groups. These data tables, charts, and transcripts were given to the members of the Project Improvement Team for analysis and also as a step in the involvement process. First, I believed that they needed concrete data from the school's parents and teachers to use as the basis for their work. Second, I hoped that data analysis by members of the Team would prove to be a first step in the process of team building. In fact, it provided an arena where the teachers and parents who were members of the Team could begin to communicate objectively about the program.

Parent Focus Groups. Focus groups offered opportunities to illuminate issues that were unforeseen when I designed the questionnaires. The processes that were employed to organize the accumulated data from the surveys and focus groups involved a number of Quality tools (Quality Improvement Tools). The members of the Project Improvement Team read through the 13 tables and examined the 10 charts that were described previously. They also studied the transcripts of the focus groups. They then prepared a master list of issues that had been raised by the survey and focus group data. I organized the issues into an Affinity Diagram. Weighted voting was used to prioritize the issues. I then prepared a Tree Diagram to show the connections and relationships of issues.

Therefore, the analysis of the survey and focus group data was accomplished by the members of the Project Improvement Team, not by me. I have included the data from the short answer questions of the surveys, 13 data tables of percentages and the 13 corresponding tables of raw data of parent and teacher perspectives of the science program, in Appendices K and L of this paper, but I describe it only in terms of how it was used by the members of the Project Improvement Team. I organized the narrative data from the surveys and the transcripts of the meetings of the focus groups into ten large charts (each two feet by three feet in size). I have not included all of these in the appendices because of the bulk of these documents. However, a sample of one of the charts is included in the Appendices (Appendix S). The data that are contained in these documents are described in this chapter only in terms of how the members of the Project Improvement Team perceived used the data and its relevance to the research questions of this study.

Tier II - Parent Involvement in the Science Program

Descriptions of Data Sources

Transcripts of Project Improvement Team Meetings. I audiotaped all of the meetings of the Project Improvement Team and transcribed them verbatim. The resulting data source is 77 pages in length. A sample is included in the Appendices (Appendix U). Prior to each meeting, I distributed a copy of the previous meeting's transcript and an agenda for the next meeting to all members of the Team so that they could reflect on the work they had accomplished and also check the transcripts for accuracy.

Interviews Project Improvement Team Members. The individual interviews provided another major portion of the data of this study. The resulting document is 119 pages in length; a sample interview is included in the Appendices (Appendix V). The interviews focused exclusively on the parent involvement process. The individual interviews were of the standardized open-ended variety as described by Patton (p. 117). Asking the same questions in the same order allowed me to organize the data relatively easily. Questions included all categories suggested by Patton: behavior/experience, opinion/value, feeling, knowledge, sensory, demographic/background (p. 121).

Researcher's Journal. I recorded my observations and conversations regarding parent involvement in my journal throughout the study. My entries recorded information about the dynamics of group interactions as well as parent perceptions regarding the science program; they reflect my thoughts throughout the process and included both my thoughts after every significant step of the study (e.g., a focus group meeting or an interview) but also those that occurred to me at idle moments. I used my notebook computer for my journal entries, printing out the new data after each entry.

Procedures

Project Improvement Team. Members of the Project Improvement Team were selected from those who volunteered for the Team during the focus groups. I had obtained their informed consent via both the cover letter that accompanied the survey's questionnaire and follow-up letters (Appendix E). Participation of the Project Improvement Team had to be limited to provide for a both a cross-section of parents and a workable group size. Ultimately, eight parents participated out of 18 who indicated interest. They included 11 mothers and seven fathers (Researcher's Journal--March 14, 1995).

My role during the meetings of the Project Improvement Team was to facilitate its sessions, collect and organize the data, and give it back to the members of the Team. While the Team's work was important on one level (Tier I) because I am an administrator of the school and am very interested in the success of the science program, I recognized that it was the responsibility of the science teachers to do the Team's actual work regarding improving the science program. In terms of this study, I participated in the science aspect of this study only as a collector and organizer of data. I neither analyzed the data nor participated in the development of plans for improving the program that resulted from the work of the Project Improvement Team. My role as a researcher (Tier II) was that of a participant-observer: to record my impressions of the parent involvement process in my journal; to audiotape, transcribe, and analyze the meetings of the Project Improvement Team; and to interview all of the members of the Project Improvement Team at the conclusion of their work.

I anticipated that the audiotapes of the meetings and interviews of members of the Team as well as my researcher's journal would produce deeper and richer data regarding parent involvement as the study progressed. In effect, the science program would become a vehicle for me to explore the process of parent involvement in curricular improvement.

The 18 parents who volunteered to serve on the Project Improvement Team included 12 people who either had been or were currently employed in science or technology-related industries and six who had experience as teachers or educational aides. Five, all mothers, were currently at home full-time. Their children included 10 daughters and 14 sons including 10 sixth graders, eight seventh, and six eighth (Researcher's Journal--March 14, 1995). Therefore, the volunteers represented a demographic cross-section in every way except employment. It was clear that science professionals and educators dominated the parent volunteer group. Ultimately, the 12 members of the Project Improvement Team were selected by me from the science teaching staff and the parents who were involved in the focus groups. An effort was made to include teachers from each of the school's three grade levels as well as a representative sample of parents.

I made personal telephone calls to encourage parental involvement on the team. Ultimately, I selected eight parents to serve on the team. These included four fathers and four mothers, all of whom had experience in the worlds of science, technology, or education. Their middle school children included six daughters and four sons--three from grade six, five from grade seven, and two from grade eight (Researcher's Journal--March 21, 1995).

An optional meeting for all members of the science department was held after the survey and focus group data was compiled to brief them on the data that had been collected. I explained my plan--to assemble a team of teachers and parents to develop a plan for improving the science program. I then asked for volunteers. Four teachers indicated interest, two from grade six, one from grade seven, and one from grade eight. I had originally planned to confer with the science coordinator to select a cross- section of teacher participants on the basis of their knowledge and involvement with the development of the new science program. I had anticipated a total of three teachers, one per grade level. However, when I decided that all four of the volunteers should be included because the second volunteer from the sixth grade teachers was in her first year of teaching at the school and could add a fresh perspective that might be missed by the other three teachers, all of whom had been involved with the science program from its inception (Researcher's Journal--March 15, 1995). In this case, the self-selection process produced the teacher team that matched the vision of the researcher.

I opened the first meeting of the Project Improvement Team by describing the science program and outlining its development. I also explained the merging of the school project, improving the science program, with educational research into parent involvement in curriculum development. I then summarized the student and parent involvement to date--previous student surveys and focus groups as well as the parent and teacher surveys and focus groups that provided the data for the Team to address. I also established the roles of participants: mine as facilitator and researcher, those of Team members as both workers and leaders who were representing the 300 parents and 10 teachers who responded to the surveys as well as the 37 parents who participated in the focus groups. Finally, I outlined three tasks for the Team to accomplish:

1. data analysis--identification and prioritization of parent and teacher concerns
2. problem-solving--reaching of consensus on ways to resolve issues
3. communication--telling other parents and teachers what Team accomplishes (Project Improvement Team--March 30, 1995).

Interviews of Project Improvement Team Members. I audiotaped and transcribed all of the interviews in the same fashion I used for the meetings of the Team. Interviews were conducted in my office at the Middle School at mutually convenient times--before, during, or after school. The backgrounds of the participants were familiar to me because of their work of the Team. However, it was necessary to check demographics during each interview to confirm information about each of the parent interviewees. The rest of the interview questions (Appendix I) arose from the research that preceded the interviews.

Researcher's Journal. I continued to write in my journal almost daily. I was careful to enter my thoughts after every meeting of the Team and every interview in addition to times when I was working alone, transcribing or organizing data (Appendix W).

Data Analysis

The process of analyzing data on the parent involvement process (Tier II) began when the questionnaires were analyzed and continued throughout the study. I attempted to note observations about focus group and Project Improvement Team dynamics in my researcher's journal after each meeting.

Data on the parent involvement process were produced by the parent and teacher surveys, the parent focus groups, the transcripts of the meetings of the Project Improvement Team, and my researcher's journal. The task of organizing the data was formidable but was accomplished by color coding and manually sorting the data into Affinity Diagrams.

Specifically, the computer printout for each data source was copied onto a different color of paper. I then reread the printouts and made notes in the margins indicating the pages of the transcripts from which the pieces of data originated and also ideas regarding preliminary categories. I then cut out the pieces of relevant data and placed them on five sheets of oaktag that each measured two feet by three feet. The data were manually repositioned until categories emerged. In general, comparison of responses within and between the parent and teacher groups provided data regarding each group's opinions of the parent involvement process that they had experienced as well as the roles that parents played in the process.

Research Concerns

Limitations of the Study

There were two limitations to the study which were inherent in its research design. The first was that the parent sample for the survey was self-selected, a procedure that was unlikely to result in a cross-section of respondents even though all parents were invited to participate. Furthermore, the focus group participants were also self-selected and included all who volunteered by responding to an invitation to participate that was on the parent questionnaire. Then, the parent members of the Project Improvement Team were selected by me from a third group of volunteers, those who indicated interest during the focus groups. Therefore, the parent survey and focus groups as well as the parent members of the Project Improvement Team represented self-selected samples. Nevertheless, the study was designed to offer opportunity for parents to voice their concerns.

A second limitation of the study involved the particular nature of the community which may limit its generalizability to less homogeneous sites. The school that is the site of the study has well-established patterns of parent involvement and interest as well as extensive parent networks in the community. The town is racially homogeneous and is largely middle-class. Therefore, the results of the study may not be applicable to communities where there is greater diversity in the population or where parent involvement is not the norm.

Validity

My position as an assistant principal at the school allowed me to be on-site and involved with the parent involvement efforts at the school on a daily basis. Hopkins (1989) suggests that the validity of qualitative data may also be enhanced by saturation, the total immersion of the evaluator in the data (p. 69). While some may view my immersion as a deterrent to objectivity, the fact that I was present at all times placed me in a position to observe much that occurred. I attempted to report the perceptions of the parents and teachers who participated in the study exactly as they were related to me.

Member checks took place throughout the focus groups, meetings of the Project Improvement Team, and following the individual interviews of members of the Team. Checking of the focus group data was accomplished by giving a copy of the transcript data to the teacher who attended all five meetings and asking her to verify its accuracy. The audiotapes also provided a backup for the responses of participants that were recorded on a flip chart during each session.

My approaches to member checking both the data from the meetings of the project Improvement Team and the individual interviews of members of the Team were similar. In the first case, I distributed a transcript of the previous meeting with the agenda for the next. In the second, I sent a copy of each individual's interview transcript with my letter of thanks for participating.

Controlling for Bias

Individual values are always a factor. It has been said that "...it is impossible to separate the inquirer from the inquired into" (Guba & Lincoln, 1989, p. 88). Some believe that although it is important that researchers be aware of their own biases and identify them (Janesick, 1994, p. 212; Richardson, 1994, p. 518), subjectivity may actually be an asset because those who are invested in something are likely to be motivated to make significant contributions (Peshkin, 1988, p. 18).

I admit to biases in regard to Tier I of this study which focuses on the science program at the school that is the site of this study. These are rooted in my many years of science teaching and my familiarity with the literature of the current science education reform movement. However, it is the subject of parent involvement that is the focus of this study. Although I believe that parental involvement is a good thing and that it is essential to the success of any program that parental concerns be addressed, at the beginning of the study I had few preconceived notions regarding how to involve parents and in what capacities.

I attempted to control for my personal biases in several ways. First, this study included a number of different data sources. These included both parent and teacher surveys and transcripts of the parent focus groups in Tier I and transcripts of both meetings of the Project Improvement Team and individual interviews of Team members as well as my researcher's journal. These sources of data offered varied approaches to data about the science program in Tier I and parent involvement in Tier II. The study, therefore, includes an abundance of both data sources and research methods. Denzin (cited in Patton, 1987) describes this as data and methodological triangulation (p. 60). This view is supported by others who have stated that concurrent validity may be established by determining if data from different sources is the same (Henerson, Morris, & Fitz-Gibbon, 1987, p. 143). Comparison of data from parents who participated in the survey, focus groups, and Project Improvement Team provided a check of this kind of validity. It is generally accepted that the more sources of information that are used in a study, the more valid its findings will be.

My way of controlling for bias during the focus groups was to invite the same science teacher to attend all five focus group sessions. Her presence enabled me to stand back, observe, and record the interactions of the participants. I posed the initial questions and sometimes asked for specific clarifications, but did not enter into discussions with the parents unless a question was asked specifically to me. I also conducted structured interviews of the members of the Project Improvement Team in an attempt to maintain control over the interview process and avoid departures from the subject matter.

Chapter IV

PRESENTATION OF DATA AND ANALYSIS

Introduction

The umbrella that covers my presentation and analysis of the data of this study is the research question, What happens when parents and teachers seek to collaborate in the reform of the science program? I attempted to answer this question by showing that in this study, parents and teachers appeared to assume three roles. The first was as providers of information regarding a number of topics: demographics, the science program, their attitudes, and the process of parent involvement. In this role, they also contributed many insights about procedures that can be used to involve parents in curriculum development, the subject of the other research question of the study.

Second, the parents and teachers who were members of the Project Improvement Team also seemed to become collaborators in planning. Collaboration began when Team members worked together to analyze the data of the surveys and focus groups. This work provided the basis for their joint efforts to develop action plans to improve the science program and to communicate with the school's parents.

The data of the study appear to indicate that Team members then moved to a third level of involvement; they did not stop after the planning phase but extended their work to implementation, rolling up their sleeves, and working together to effect changes to both the science program and the communication systems at the school. In this third role, the Team's parent and teacher members appeared to become partners in implementing and improving the science program. The presentation of the data of this study is organized under these three levels of involvement.

Providers of Information

Demographics

Parent Sample

Surveys and Focus Groups. Exactly 300 of the 888 parent questionnaires were returned to my office between the dates of January 9-25, 1995; this represented a return rate of 34 percent (Researcher's Journal--January 29, 1995). All 10 of the school's science teachers returned their questionnaires. Of the 73 respondents to the parent surveys who indicated initial interest in participating in a focus group, 37 actually attended (Researcher's Journal--March 12, 1995).

I was aware that the self-selection process for determining focus group participants would be unlikely to produce a cross-section of parents. In fact, the round-robin introductions that were included in each focus group showed that many of the participants were well-educated science professionals: engineers, science researchers, science educators. I estimated that approximately 75% of the participants in one focus group were science professionals (Researcher's Journal--February 22, 1995).

The sizes of the parent and teacher samples for the surveys were determined by the populations of both groups; all parents and teachers were invited to participate. In terms of comparative data analysis, the limited size of the teacher sample (10 teachers) presented a problem because one teacher's response produced a 10 percent difference in the data. Nevertheless, the teacher respondents included all of the science teachers at the school, so the sample included the entire range of teacher perspectives.

I limited my analysis of the demographics of the parent respondents to the determination of whether or not the respondents represented a cross-section of the school's parents. The task of deciding whether respondents in the demographic categories held similar or differing perceptions of the science program was left to the members of the Project Improvement Team as part of the first phase of their work.

The demographic data that were collected in the survey (Table 1) indicated that in all categories except levels of student achievement, respondents represented a cross-section of parents. First, similar

Table 1

Demographic Data of Parents and Their Children[4]

A. Elementary School Attended in Grade 5

School Attended in Grade 5	Percent of Students
District School 1	18
District School 2	22
District School 3	24
District School 4	24
Parochial School Located in Town	1
Elementary School Not Located in Town	10
School Not Reported	1

B. Child's Most Recent Grade in Science

Grade	A+, A, A-	B+, B, B-	C+, C, C-	D or F	Not Given
Percent of Students	55	31	8	1	4

C. Child's Present Grade Level

Grade Level	Six	Seven	Eight	Not Given
Percent of Students	37	33	32	1

D. Child's Sex

Sex of Child	Female	Male	Not Given
Percent of Respondents	52	47	1

E. Child's Attitude about Science

Child's Attitude	Improved	Stayed the Same	Worsened	Not Given
Percent of Students	49	41	9	0

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[4] Percents are rounded to the nearest whole number and were calculated by dividing raw scores by 300, the total number of respondents.

percentages (18, 22, 24, 24) of the children of the parents who returned their questionnaires had attended the town's four elementary schools. These percentages paralleled the proportions of students that had attended the schools; District Schools 2, 3, and 4 were of similar sizes, but District School 1 was smaller. Furthermore, the populations of the students who had attended the town's parochial school (1%) and out-of-district elementary schools (10%) were representative of the school's population as a whole.

The science achievement grades that were reported by parents who responded to the survey indicated that their children's grades were higher than those of the general population of the school. I examined the honor role listing for the second marking period which was issued at approximately the same time as the parent survey was conducted and found that 62.5% of sixth, 59.3% of seventh, and 52.3% of eighth graders had attained honor roll status.[5] However, 86% of parent respondents to the survey indicated that their children had achieved their most recent science grades of either A or B (Table 3). Therefore, it appears that the parents who responded to the survey tended to be parents of the school's higher achievers, at least in science classes. Furthermore, since focus group participants were drawn from the respondents to the survey and members of the Project Improvement Team from those who volunteered during the focus group sessions, it is also probable that the parent participants in all levels of this study were parents of high achievers.

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[5] Students who attain honor roll status at the Middle School must achieve averages of 85% with no grade below B- for the marking period.

This difference could have been due to one of two factors. First, the questionnaires were distributed to parents by students via Friday folders. It may have been that the school's higher achieving students also had better work habits and, therefore, would have been more likely to give the questionnaires to their parents and deliver the completed questionnaires back to their homeroom teachers. Second, children who have parents who are involved in their educations have been shown to achieve at higher levels (Schneider & Coleman, p. 4; Banks-Williams, 1991, p. 34). It would follow that the parents who took the time to complete the questionnaires were the ones who were most involved in their children's educations.

The respondents also represented all of the school's grade levels. The proportions (Grade 6 - 37%, Grade 7 - 33%, Grade 8 - 32%) paralleled the populations of the grade levels; the seventh and eighth grades were of similar size while the sixth was larger.

I surmised that the slightly higher percentage of questionnaires returned by parents of female students (52%) as opposed to parents of males (47%) might be due to differences in adolescent work habits between the boys and the girls; it is possible that the girls were more reliable in delivering the questionnaires to their parents.

The data about the child's attitude regarding science were a response to the statement, "Please indicate changes in your child's attitude about science since he/she entered the Middle School." The largest percentage of respondents indicated that their children's attitudes had improved (49%). I interpreted this to mean that the students were enjoying science more. However, it is also possible that the elementary schools had focused less on science. If this were the case, the newness of the subject matter might have influenced student attitudes in a positive direction.

Therefore, the demographic data that were provided by the parents who responded to the survey seemed to indicate that the respondent sample was representative of the school's parents in all respects except the achievement levels of their children. However, I had made provision for such sampling differences by providing a means for sorting the parent survey data into the four demographic categories. This allowed the members of the Project Improvement Team to analyze the data within each demographic category in order to determine the relationships of the parents' demographic profiles to their perceptions of the science program.

Members of Project Improvement Team. The eight parents who became members of the Team had been selected by me because they represented a cross-section of the 18 who volunteered in terms of their own sexes as well as the sexes and grade levels of their children. I selected four mothers and four fathers. They were the parents of four male and six female students at the Middle School including two sixth, five seventh, and two eighth graders.

An examination of the credentials of the parents who volunteered for the

Team revealed that all were educated for careers in the fields of either education or science/technology. I speculated that parents with these backgrounds were more likely to be interested in science education and, therefore, more likely to volunteer to participate on the Project Improvement Team. It is also possible that parents who lacked these backgrounds might have felt intimidated by the mystique that has always surrounded science, that it is "too hard." Such feelings may have kept other parents from volunteering.

Three of the four science teachers who were members of the Project Improvement Team were also parents and had, therefore, had opportunities to be involved in schools in parental roles. However, the transcripts of the interviews showed that the teachers, when asked about their prior involvement in schools, generally described their teaching careers and did not mention other forms of parent involvement. Two of the teachers answered, "No," to this interview question (Interviews--June 13 and 16, 1995); a third mentioned that he had been a member of the Middle School Governance Council for two years but had not been involved in anything else involving parents in decision making (Interview--June 13, 1995). The teachers had all taught for 10 to 13 years, one entirely in our middle school, the others with experience in other districts also (Interviews--June 13, 1995; Project Improvement Team--April 13, 1995).

The one teacher who spoke of her involvement as a parent rather than as a teacher described her visits to her daughter's classroom and various forms of communication that she used to stay abreast of her daughter's progress in school. She added ways that she had involved parents in the activities of her own classroom: volunteering during laboratory experiences; asking students to teach their parents what they have learned in the day's science class; sending portfolios, tests, and projects home for parent comments; inviting those with expertise in science to enhance her science program (Interview--June 13, 1995).

I believe that the profiles of both the parents and teachers who were members of the Project Improvement Team support my contention that the Team was unusual. Both parent and teacher members of the Team were well-educated professionals in the fields of education, science, and technology. Furthermore, all but one of the teachers were parents and had experienced various levels of involvement in their children's schools. Perhaps, these commonalities contributed to their apparent willingness to work together.

Relationship of Demographics to Perceptions of Science Program

Gender Differences. The members of the Project Improvement Team began their study of the demographic data by examining gender differences (Appendix K, Table 4). Team members noted that there were only three statements that elicited differences in responses between the 142 respondents who were parents of boys and the 156 who were parents of girls. First, 73 percent of the parents of girls but only 64 percent of parents of boys agreed that the science program contained ample laboratory and hands-on experiences. Conversely, more parents of boys (85%) than parents of girls (78%) stated that their children had positive attitudes about science. A third difference was in response to the statement, "Parent participation in curriculum improvement efforts (such as this one) is appropriate." More parents of girls (78%) than parents of boys (69%) indicated agreement with this statement.

During one of the meetings of the Project Improvement Team (Project Improvement Team--April 13, 1995), I mentioned that my pilot study had indicated that there were some issues that might be gender related but that I could see only one area of difference in the data. A smaller percentage of parents of boys (78%) than parents of girls (85%) indicated that developing positive attitudes was a component of an exemplary science program (Appendix K, Table 5). These percentages were the inverse of those regarding attitudes of children that were cited previously; fewer parents of girls believed that their daughters had positive attitudes about science, but more parents of girls believed that developing positive attitudes was an important goal of an exemplary science program. This difference was discussed by the members of the Team, but while they found the data to be interesting and later considered gender differences on several occasions (Project Improvement Team--April 13, April 27, and May 11, 1995), they chose to treat the issue of gender equity as a societal and communication problem rather than addressing it in terms of the science program (Project Improvement Team--May 11, 1995).

Grade Level Differences. Members of the Team also examined the demographic data that was sorted by the grade level of the respondent's child (Appendix K, Table 6). One of the teachers on the Team noted that the responses of parents of sixth and eighth graders were more positive than those of the seventh graders.

> Teacher: I was interested in the responses on Table #6--the responses of students as they moved from sixth through eighth grade.
>
> Researcher: Those are parent opinions.
>
> Teacher: Yeah, a perception of what their children are feeling, correct? The majority of them went up, but I noticed that for some reason, the seventh grade went up, then down, then up again.... Almost all of them did this. If you did a graph, it would look like this...kind of V-shaped.... That jumped out at me when I looked at the data.
>
> Researcher: More satisfaction in sixth and eighth?
>
> Parent 1: I thought eighth was the highest.
>
> Teacher: In most cases, eighth was the highest, but not all the time. Projects are rated highest in grade seven, so it went the other way for that. Another one jumped out at me: connections to the real world--fourteen in six and seven to seventeen in grade eight. There was a change there.
>
> Researcher: Remember that you have different cohort groups here. This is not a longitudinal study where we are following the same kids for several years.
>
> Parent 2: One danger is that we may be looking for things to judge as different.... It might very well be a year to year variation rather than a real difference. Don't look for things like this that are different unless it will be tracked for several years. (Project Improvement Team--April 13, 1995)

This exchange ended the discussion of differences in perceptions that might relate to grade level.

Differences in Elementary School Attended by Child. The same teacher then noted that parents from one of the elementary schools seemed to be less positive than others about the science program (Appendix K, Table 7). One parent noted that out-of-district parents seemed particularly supportive of the science program. She stated, "This is very positive when people move in and immediately notice these things about our program." Team members whose children had attended each of the schools attempted to explain the differences in terms of the special interests of the principals of the schools; one was an advocate of the arts, another of technology. The parent added that while there might be small differences between the schools, parent responses probably reflected the individual teachers at each school rather than the philosophy of the individual elementary school (Project Improvement Team--April 13, 1995).

Other Differences. The last two tables of demographic data which focused on parent perspectives as they related to the attitudes (Appendix K, Table 8) and parent perspectives as compared to the achievement levels of students (Appendix K, Table 9) did not elicit discussion by members of the Team. I noticed this when I analyzed the transcript of the meeting and included the following consensus statement with my agenda for the following meeting:

> The members of the Project Improvement Team were not concerned about the minor differences between the demographic groups. After a lengthy discussion, the team members felt that some of these are likely to be the result of differences in cohort groups (e.g., present students in grades 6, 7, and 8) and normal year to year variations. There was agreement that there was not enough data to focus the attention of the PIT on differences in groups but that this information might be used as a basis for longitudinal tracking to determine trends. (Project Improvement Team--April 13, 1995)

Science Program

Much of the information about the science program originated in the data from the parent and teacher surveys as well as the transcripts of the parent focus group sessions. I designed the questionnaires for the surveys and also organized the resulting data. However, I purposely limited the depth of my analysis of the parent survey to the determination of those issues about the science program that seemed to arouse the greatest levels of parental concern. I next formulated questions related to these issues to guide the focus group discussions. The transcripts of the focus groups then provided additional data that clarified and enhanced that of the surveys.

I then presented all of the data from the surveys and focus groups to the members of the Project Improvement Team to analyze. Therefore, the data from the surveys and focus groups that pertained to the science program constituted the data for Tier I of my research design, the work of the Project Improvement Team. I set aside information from these sources that related to Tier II, parent involvement in the science program, for my own analysis at a later date.

Parent Perceptions: Strengths/Weaknesses of the Science Programs

The parent survey produced information about parent perspectives of the science program (Table 2), insights into parent opinions regarding components of an exemplary science program (Table 3), many details about parent perspectives of the science program's needs, and a number of comments. Members of the Project Improvement Team noted that parents, in general, were pleased with the science program at the school. Table 2 shows that well over 50 percent of parents either agreed or strongly agreed with statements 1-6 and 8 of the survey, apparently indicating that they supported the notion that the program included ample sources of information (60%), provided ample laboratory or hands-on experiences (68%), contained projects that were major factors in promoting understanding, furnished adequate review materials for students to prepare for tests (63%), and drew connections between science in school and science in the real world (66%). Furthermore, 80 percent of parents

Table 2

Parent Agreement/Disagreement with Statements about the Science Program[6]

Statement	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
1. The science program includes ample sources of information (such as reading handouts, on-line, and other computer resources).	8	51	11	20	4
2. The science program provides ample laboratory/ hands-on experiences.	21	47	11	15	2
3. The projects in the science program are major factors in my child's understanding of science.	16	48	15	15	1
4. The science program includes adequate review materials to prepare my child for tests.	15	48	16	16	1
5. The science program provides opportunities for my child to draw connections between science in school and science in the real world.	12	54	16	12	1
6. My child has a positive attitude about science.	37	44	7	9	1
7. The science program is exemplary.	6	34	26	22	4
8. Parent participation in curriculum improvement projects (such as this one) is appropriate.	25	48	16	6	1

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[6] Percents are rounded to the nearest whole number. They were calculated by dividing raw scores by 300, the total number of respondents. A corresponding table of raw scores may be found in Appendix L.

Table 3

Parent Beliefs Regarding Components of An Exemplary Science Program[7]

Component	Percent of Parents Agreeing with Statement
Information Sources	78
Laboratory or Hands-On Experiences	95
Projects	66
Review Materials	65
Interdisciplinary Connections	51
Parent Involvement	33
Computer Technology	71
Emphasis on Content	65
Emphasis on Skill Development	72
Lectures	24
Developing Positive Attitudes	81

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[7] Percents are rounded to the nearest whole number and were calculated by dividing raw scores by 300, the total number of respondents. A corresponding table of raw scores may be found in Appendix L.

indicated that their children had positive attitudes about science (Project Improvement Team--March 30, 1995).

However, only 40 percent either agreed or strongly agreed with the statement, "The science program is exemplary"; 26 percent disagreed (Table 3). Another 26 percent expressed no opinion about this issue. A number commented that they did not feel qualified to rate the science program. Members of the Project Improvement Team surmised that the question was worded poorly. One of the parents suggested that the question required parents to respond with an "on or off" answer but that the question should have been presented instead with a rating scale of one to five so that the parents who think that the program is good but not exemplary would have had more opportunities for choices (Project Improvement Team--April 13, 1995).

Comparison of parent perspectives about the science program at the Middle School (Table 2) and their beliefs regarding components of an exemplary middle school science program (Table 3) seemed to indicate that the program was in alignment with many components that the parents value. It appeared that the most important components in the eyes of parents were laboratory and hands-on experiences (95%), developing positive attitudes (81%), information sources (78%), skill development (72%), and computer technology (71%). Projects, review materials, and content also were rated highly (65% each).

On the other hand, there were two major discrepancies between what the parents perceived to exist already in the school's science program and what they believed constituted components of an exemplary program. First, parents placed less importance on interdisciplinary connections (51%), but the majority (66%) credited the science program with providing connections to the real world. Furthermore, almost one-quarter of parents (24%) stated that the science program did not provide ample sources of information while a similar percentage of parents (24%) stated that lectures were an important component of an exemplary middle school science program. Members of the Team interpreted this to mean that while parents felt that students needed more information resources, lectures were not a preferred means of providing content (Project Improvement Team--May 25, 1995). They also agreed that the open-ended questions (asking parents either to describe program needs or to comment on past experiences with the science program) indicated that while some parents believed that a textbook was needed to provide consistent information, continuity, and review material, the textbook issue may have been a cry for better organization of handouts rather than an actual textbook (Project Improvement Team--March 30 and April 13, 1995). There was also general agreement that the textbook should never be more than a reference, and that good teachers have always used texts in this way (Project Improvement Team--April 13, 1995).

Members of the Project Improvement Team noted a major inconsistency, that 73 percent of parents either strongly agreed or agreed that "parent participation in curriculum improvement projects is appropriate" (Table 2), but that only 33 percent believed that parent involvement is important to an exemplary middle school science program (Table 3). I had noted this discrepancy in responses prior to the meetings of the focus groups and had attempted to clarify the conflicting testimony during those meetings. At that time, one parent stated, "I felt I had already answered the question once. I could not see why it was there again, so I skipped it" (Focus Group--February 22, 1995). I had interpreted the discrepancy in data to mean that parents believed that curriculum development might be enhanced by parent involvement, but that parent involvement was not essential in order to develop an exemplary middle school science program. Furthermore, it seemed that parents believed that their involvement was important because they knew their own children and that their perceptions would, therefore, often be different from those of the teachers who saw the children only in school (Focus Group--February 23, 1995). Whether the discrepancy was due to the wording of the question, its redundancy, or to my interpretation is open to conjecture.

The first issue that Team members addressed in examining the tables of survey data was that of the need for a textbook, a concern that I had anticipated prior to the study but was also confirmed when only 59 percent of the parents stated that they believed the science program had ample sources of information (Table 2). The Team members then related that data to the comments that I had listed under the heading, Resources, on the large charts of narrative data. After examining the relevant portions of these data, one parent commented that the textbook issue was really one of a need better organization. She added that the data seemed to support the idea that the demand for a text was really an indication of the frustration that some parents felt with children who were disorganized and lost things and that parents did not know how to ask for order but knew that a text could provide it. Another member of the Team referred to a suggestion that had been made by a parent during one of the focus groups, that each student be required to have a separate notebook just for science. Other members of the Team agreed that this would be a step in providing organization of science information (Project Improvement Team--April 13, 1995).

In terms of science education practices, parents were very clear that they believed they were aware of good teaching practices in science and which teachers employed these. During a focus group, one parent commented that parents were aware which science teachers were weak and which were strong, attributed parental requests for team placements to this awareness, and stated that there was a perception in the parent community that "no one cares" (Focus Group--February 22, 1995). Another added, "Parents should not need to ferret out good teachers," in order to request placement for their kids (Focus Group--February 22, 1995). During the individual interviews, a third noted that while she believed that no one in education had the intention of doing a poor job, the fact was that times change, and some teachers do not change with them. She added that standardizing the science program would "improve the students' experience" (Interview--June 8, 1995).

Parents also provided their perceptions about some components of the science program. As an example, during several Focus Groups, discussion centered on the assigning of projects. One parent commented that parents do not like projects because they feel burdened with them. Another added that the quality of projects is often related to the science backgrounds of parents and suggested that this can result in unequal opportunities for students (Focus Group--February 22, 1995). A third parent noted that projects can tax the resources and expertise of parents and offered the notion that teachers should establish parameters for projects and then grade students on their levels of achievement in attaining those standards (Focus Group--February 23, 1995). Still another noted, "Projects involve parents. It is good for parents to know what is happening" (Focus Group--March 7, 1995). These contributions show the wide range of perceptions that parents contributed about projects, just one component of the science program.

The fourth meeting of the Project Improvement Team produced a spirited discussion about program assessment that focused on the process of evaluation. This serves as an example of an area in which parents were both knowledgeable and interested. Several of the parents were working in science-related industries and had received training in Quality Management processes. One stated that program improvement should be measurable and that the best way to do this was to set goals, monitor specific actions and the degree to which these are implemented, and then assess whether they have had the desired impact. Another added that a district mastery test could be developed for each grade level as a means for measuring program success over time and also to have teachers assess what aspects of the program have been successful every two years with the idea of tossing out the weaker elements and trying new ideas (Project Improvement Team--May 11, 1995).

Another arena in which parents provided information was that of communication about the program. One parent stated that there was "...a need to communicate the goals of the new program to parents..." because "...the program needs their support." Another suggested that teachers communicate with parents via the Friday folders at the beginning of each unit by sending a description of the new unit and a request for parents with expertise in that content area to serve as resources for the teacher and the students (Focus Group--February 22, 1995). A third parent in a different focus group raised the question of whether parent information is fact or fiction by saying, "Are we discussing perceptions or reality? Maybe parents have the perception that there are problems when there really aren't any. The science program should be explained to parents" (Focus Group--February 22, 1995).

The data sources regarding the science program (survey data contained in Appendices K and L, 10 charts of narrative data from the surveys, summaries of information collected during the focus groups) are testimony to the fact that parents contributed vast amounts of information about their perceptions of the science program, communication, and assessment. These data came both directly from the parent surveys and focus group data, but also indirectly from the transcripts of the meetings of the Project Improvement Team, individual interviews of members of the Team, and my Researcher's Journal.

Teacher Perceptions: Strengths/Weaknesses of the Science Program

The members of the Project Improvement Team also looked at the results of the teacher survey. All 10 of the science teachers at the Middle School had participated in the survey, most indicating that they felt positively about the program (Appendix K, Table 10). High percentages also agreed that the science program included ample sources of information (80%), adequate laboratory and hands-on experiences (90%), projects that enhanced their students' understanding of science (80%), adequate review materials (60%), and opportunities for students to draw connections between science in school and science in the real world (70%). Most also indicated that they believed that their students had positive attitudes about science (90%). However, only 40 percent stated that the science program was exemplary. While a majority (60%) agreed that parent participation in curriculum improvement projects was appropriate, a sizable minority (30%) disagreed. Some also indicated that the program contained neither ample sources of information nor adequate review materials (20% each).

When asked to indicate components of an exemplary science program that they believed were important (Appendix K, Table 11), a majority of the teachers supported the following: information sources (80%), laboratory and hands-on experiences (80%), projects (70%), interdisciplinary connections (70%), computer technology (80%), emphasis on skill development (60%), and developing positive attitudes about science (70%). However, only 30 percent stated that they believed that content should be emphasized, while 50 percent supported a need for better review materials. I replied that I had been concerned about this prior to the study, but had not been aware of any alternative way to work with these data.

Even fewer teachers (20%) stated that they believed parent involvement to be important to an exemplary middle school science program. This was in contrast to the 60 percent who agreed that, "Parent participation in curriculum improvement projects (such as this one) is appropriate." The Comments section of the questionnaire elicited similarly worded statements from 20 percent of the teachers to the effect that parents "...should respect us as professionals...." However, one teacher stated, "The more expertise, the better." This inconsistency was addressed during the first meeting of the Project Improvement Team. By the end of that meeting, it was clear that parents and teachers on the Team agreed that parents should be involved in program development (expressing their perceptions, working with teachers to analyze data, establishing priorities, etc.). However, both the teachers and parents on the Team agreed that parents should not be involved in the actual writing of the curriculum. Following further discussion of this topic at the Team's second meeting, I included the following consensus statement with my subsequent agenda:

> Parents should be involved in program development (expressing their perceptions, working with teachers to analyze data, establishing priorities, etc.). However, both the teachers and parents on the Project Improvement Team believe that parents should not be involved in curriculum writing. (Project Improvement Team--March 30, 1995)

It appeared that the Team members were beginning to draw individual conclusions and also to reach consensus about some of the issues that parents had raised.

In response to the open-ended question regarding needs, 60 percent of the teachers stated that networked and on-line computers were needed in classrooms. Other needs that were cited included textbooks (30%) and review materials (20%). Individual teachers mentioned better assessment techniques, more time or double periods for laboratory work, and additional opportunities for collaboration and planning within the science department. All of these issues were duly noted on flip charts. After each Project Improvement Team meeting, I entered the flip chart information into the computer and distributed it to Team members in the form of consensus statements which were sent to all Team members prior to the subsequent meeting.

Comparison of Parent and Teacher Perceptions

The total agrees (strongly agree plus agree) and total disagrees (strongly disagree plus disagree) presented some differences between teacher and parent perceptions of the science program (Table 4).

More teachers than parents believed that the science program provided ample sources of information (80% and 59%) as well as laboratory and hands-on experiences (90% and 68%). Fewer parents (64%) than teachers (80%) agreed that the program's science projects were major factors in students' understanding of science. However, when parents and teachers were asked to identify components of an exemplary science program (Appendix K, Table 13), the only major difference was in regard to the importance of emphasizing content. More parents (65%) than teachers (30%) considered content to be an important component of an exemplary science program.

Therefore, the data from the survey indicated that parents and teachers generally agreed about the components of an exemplary science program but that they disagreed regarding the importance of content. This difference was one of the issues that led the members of the Team to believe that the topic of resources was one that bore further consideration (Project Improvement Team--April 13, 1995).

Table 4

Comparison of Teacher and Parent Perspectives of Science Program[8]

Statement	Strongly Agree		Agree		No Opinion		Disagree		Strongly Disagree	
	T	P	T	P	T	P	T	P	T	P
1. The science program includes ample sources of information (such as reading handouts, on-line, and other computer resources).	30	8	50	51	0	11	10	20	10	4
2. The science program provides ample laboratory/ hands-on experiences.	40	21	50	47	0	11	0	15	0	2
3. The projects in the science program are major factors in my child's understanding of science.	60	16	20	48	0	15	10	15	0	1
4. The science program includes adequate review materials to prepare my child for tests.	10	15	50	48	0	16	10	16	10	1
5. The science program provides opportunities for my child to draw connections between science in school and science in the real world.	30	12	40	54	0	16	10	12	0	1
6. My child has a positive attitude about science.	30	37	60	44	0	7	0	9	0	1
7. The science program is exemplary.	20	6	20	34	30	26	0	22	0	4
8. Parent participation in curriculum improvement projects (such as this one) is appropriate.	20	25	40	48	0	16	30	6	0	1

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[8] Percents are rounded to the nearest whole number and were calculated by dividing raw scores by the total number of respondents in each category, 300 parents, 10 teachers. A corresponding table of raw scores may be found in Appendix L.

The members of the Project Improvement Team did not choose to address either the data that was shown by Tables 10-13 (Appendix K) or the minor demographic differences that they noted in the large charts of narrative data from the parent surveys. Although I gave them all of this data plus a summary of all of the narrative comments that teachers had contributed in response to the open-ended questions of their survey, Team members focused mainly on general parent responses rather than on demographic breakdowns. They agreed that data from one year were inadequate to determine if the minor differences indicated by different demographic groups were indicative of true demographic differences or were merely reflective of normal year-to-year fluctuations in responses. They suggested that the demographic data be preserved as a baseline for a possible future longitudinal study to determine trends (Project Improvement Team--April 20, 1995).

By the end of the second meeting of the Project Improvement Team and approximately two weeks of studying the survey and focus group data, Team members were beginning to see connections between the items that needed to be addressed regarding the science program. Near the end of that meeting, I said, "Our goal for today was to identify the problem areas and try to prioritize them. We have four so far: textbooks, communication, review materials, and enrichment." A few minutes later, a parent member of the Team stated, "I believe we should focus on three things: Resources (including textbook, handouts, rubrics for parents, technology), Communication, and Consistency"

(Project Improvement Team--April 13, 1995). Ultimately, these topics became the categories for the Team's improvement efforts. This was when I looked to the Quality Management tools as means for organizing and prioritizing concerns.

Attitudes of Parents and Teachers

During the stages of this study's parent involvement process (surveys, focus groups, five meetings of the Project Improvement Team, individual interviews), it seemed that the attitudes of both parents and teachers about parent involvement became more positive as the level of involvement intensified. I felt that there was a direct relationship between the level of involvement of the participant and the number and quality of positive comments.

Parent Involvement Process

Parent and Teacher Surveys. Comments on the parent survey revealed a continuum of attitudes regarding parent involvement that ranged from negative to uncertain to positive. However, most fell closer to the negative end of the spectrum. Negative comments included:

> Most parents do not have an adequate handle on science to know what the child needs. Parent involvement in curriculum development is unnecessary.
>
> Parent participation is good if the cost of doing so is not that high. I'd rather see money spent to educate.
>
> Survey is unnecessary. Spend more time teaching, less time

procrastinating.

We do not need this survey. Spend time instead developing existing programs. These surveys are not constructive.

Spend time educating. The old formula worked. Try it again. Thirty years ago I received a better public education without wasting all the time on surveys and nonsense.

The school cannot be responsible for everything. Time should be spent teaching. If taught well, the program will be exemplary. Suggested survey question: Why did we (Does this mean the parents as opposed to today's students?) learn, retain, and score higher in science?

There were also a number of parent comments that seemed to indicate uncertainty about parent involvement. The following are examples of these:

Parent participation is important but difficult to do. We go by what our child tells us. It is impossible to answer all questions unless we are in the classroom to evaluate.

Involvement of a few parents with strong science backgrounds is appropriate. Parent-at-Large involvement could jeopardize an excellent program. I have had contact with parents who are negative about all public school programs and are very vocal. Can't satisfy all of them.

Parent participation is only good if the parent has a strong science background which the average parent does not have.

Parent involvement should be only to give advice. Professional educators should have the final say on curriculum.

Ask people in science fields. These people can truly evaluate the program.

If you want opinions about science classes, ask the kids. Kids know what is going on, not the parents.

There were two parent responses that indicated willingness to participate in the parent involvement process but did not give specific feedback indicating an opinion on the value of the process. These included:

> I would be delighted to participate in the program.
>
> I went to a National Science Foundation Institute (3 weeks) in the summer for middle school teachers. I am willing to serve on the Project Improvement Team.

I inferred from their willingness to participate that these parents believed that parents should be involved in curriculum development, but they did not actually say that they were supporters. The only parent comment that appeared to indicate unequivocal support for the parent involvement process was the following: "We need more parent participation. Participation opportunities have not been offered."

The teacher survey also reflected the same spectrum of attitudes. There were only three survey comments that specifically addressed the issue of parent involvement; one fell into each category. The negative comment was:

> I do not feel that parents should be involved in curriculum writing. Parents need to respect our integrity. Sometimes I feel like I have no credibility. Let parents help us in the process of teaching.

Another teacher offered a more moderate comment: "I think that parents should be involved in their areas of expertise to enhance the science program. However, I think parents have to respect us as individuals." Even the positive comment on the teacher survey reflected a degree of uncertainty: "I'm all for parent involvement, but since we are professionals, I am not sure of the impact they should or would have." It appears that the opinions of parents and teachers that were reported in their responses to the surveys tended to be in the negative to cautious range, but that more parents were inclined to support the notion of their involvement in curriculum development than were the teachers.

Parent Focus Groups. The focus group discussions produced only two opinions that reflected parental attitude regarding parent involvement, and they both seemed totally positive. The first was, "Parent involvement is important because parents know their own children. Their perceptions will, therefore, be different from the teachers who see the kids only in school" (Focus Group--February 23, 1995). The second was, "Focus groups are comfortable for parents. I can say things here that I would not say to a teacher because there is no fear of repercussions. This is much easier than one-on-one with a teacher" (Focus Group--February 22, 1995). It is interesting to note that the focus groups, which obviously required greater parent involvement than that of the parent questionnaires, produced only these two seemingly positive comments regarding parent involvement. This was when I began to consider a possible relationship between the degree of parent involvement and positive attitudes.

However, during another focus group, a parent stated, "Parents are on guard about committing themselves because time is so precious. They are afraid of overcommitment" (Focus Group--February 22, 1995). This seemed to offer a possible explanation for parental reticence or uncertainty but not a rationale for the negative attitudes. Therefore, it appeared that in the early stages of the study both parents and teachers tended to be either negative, or, at best, uncertain about the value of parent involvement.

Project Improvement Team. However, attitudes seemed to change as parents and teachers became more involved in the process of parent involvement. As an example, I noted after the first meeting of the Project Improvement Team that one of the teacher members was an enigma to me. My journal entry reflects that concern:

> I sense that [teacher member of Team] has not really bought into this--that he's there because...[he feels] he has an obligation to attend. He also seems to convey the impression that he believes that our program is so good that there is no need to improve it to satisfy the few that do not like it. (Researcher's Journal--March 30, 1995)

After the fourth meeting of the Team, I noted:

> The parents were also clear in their desire for the Team to continue into next year as a communication vehicle. I sense that most of the teachers think that this is a good idea but that one [the same teacher] is going along with it because he recognizes that he is outnumbered. That has been his attitude from the beginning--but he's also grown in this time. He tends to exhibit a "show me" approach--asking questions that show he is not totally supportive of the parent involvement process
>
> but then coming around after he hears the ways they can help the program. (Researcher's Journal--May 1, 1995)

During the individual interviews, the teacher stated his initial uncertainty himself. He said, "I think that we were all a little bit overwhelmed at first about starting it and keeping it going and everything else" (Interview--June 13, 1995). Later in that interview, I asked him how he felt about his part in the parent involvement process. He replied:

> I have a sense of excitement, but I also have a sense of feeling a bit overwhelmed at the same time. You know, you are excited about what you see happening, but then, you are like, 'Wow. This is even more work.' (Laughter) It's like... I think as a teacher, I can't lose focus of what my most important job is, and that is to instruct the kids in my classroom and give them as much as I can without spreading myself too thin and getting myself too involved in too many other things. (Interview--June 13, 1995)

Another interview on the same day produced an unsolicited comment about the same teacher's attitude. The interviewee asked, "Can I say what I mean?" and then went on to state, "I think that [other teacher] is much more comfortable now than he was at the beginning" (Interview, June 13, 1995). A few minutes later, she added, "I saw him change from being on the defense to actually being more supportive of it [parent involvement]. I believe in it [parent involvement], so I tend to see the positive things" (Interview--June 13, 1995). She seemed to corroborate my impression that the teacher's attitude had improved as his level of involvement increased.

During the individual interviews, several parents and teachers voiced their initial fears about the parent involvement process. One teacher commented, "I was a little worried at the beginning" (Interview--June 13, 1995). Another stated, "I was very apprehensive, and I did not know what I could bring to the group. I didn't know what my contribution could be or where my place was, and after I got into it, I said, 'O.K. I can do something.' So, my little voice..." (Interview--June 13, 1995).

A parent contributed, "At the beginning I thought that maybe I should not be in this field--per se science--but I really felt good about it, and I felt good about our outcome" (Interview--June 5, 1995). A second parent reflected, "...it was not until after the first meeting that I did know exactly what we would be doing. I knew it was not going to be writing curriculum anyway, but I thought, 'What did we talk about in the focus groups, and what was on the questionnaire?' Once the group got flowing...I was not apprehensive..." (Interview--June 8, 1995).

Roles of Parents on the Team

The last three comments, from both parents and teachers, seem to reflect concerns regarding the roles that parents and teachers would play on the Project Improvement Team. This subject was addressed at length during the Team's first meeting. One parent commented that she felt it would be helpful to clarify the roles of the parents and asked, "Are we responding to the needs of our own children? Are we representing other parents as a group of parents? Are we expected to work with the teachers to devise the curriculum?" Another added, "What are we to accomplish? Is it to have parent involvement in the science curriculum?"

These questions came as surprises to me because I had made personal telephone calls to invite each volunteer to join the Project Improvement Team and had outlined three tasks for members of the Team. I had also described these again in my introductory remarks to the members of the Team a few minutes before the questions were raised. These included:

1. Data Analysis - identifying parent and teacher concerns about the science program

2. Problem Solving - attempting to reach consensus on ways to resolve the issues identified during the analysis process

3. Communication - informing parents and staff about the work of the Team. (Project Improvement Team--March 30, 1995)

I responded that while I believed that parents would never be able to divorce themselves completely from their own children, the parent members of the Team were also representing approximately 1,800 parents of approximately 900 middle school students. I stated that the parents and teachers on the Team had the responsibility to consider the perspectives of the 300 parents and 10 teachers who had responded to the survey as well as those of the parents who had participated in the focus groups. I added two opinions, the first that the parent members of the Team should respond to the data, both as parents of individual students but also as representatives of all of the parents in the school. Second, I believed they should work with the teacher members of the Team to plan revisions to the science program, but I did not anticipate that the parent members of the Team would actually do the revisions (Project Improvement Team--March 30, 1995).

The teachers also expressed their concerns about the roles of the teacher members of the Team. One reiterated that the Team would look at the data, make recommendations, and find focus areas for improvement. Another stated it slightly differently: "We are to find out what the parents' piece is, what their needs are, and fill it" (Project Improvement Team--March 30, 1995).

An exchange between a teacher, a parent, and myself followed and seemed to underscore the uncertainties about roles that accompanied the early stages of the Team's work.

> Teacher: I'm still a little bit fuzzy on the roles of the parents here in terms of what they can help us to do. I know that no matter how good a program is, there will always be parents who are not happy with it. I really do not believe it is our role to go out and try to satisfy those who are complaining about one little thing or another. If we look at the data, it seems that most who responded did so in a very positive way. I think our role in terms of trying to alleviate the few problems that might exist is one that we should spend a lot of time on. So, it seems like you are leaning that way. Having them be our eyes in the community to see what the community is saying about our program.... If that is the direction, I think that I don't like it. (Transcript of Audiotape of Meeting of Project Improvement Team--March 30, 1995)
>
> Researcher: I think that is part of it, but I think parents see children differently than we see them in school. If 75% percent of the parents think everything is fine and 25% don't, then there is definitely room for improvement. While we can pat ourselves on our backs because of the 75% who are satisfied, we still need to work. I would not want to go to a surgeon who was 75% effective. I would not have been satisfied with my kids' grades or my own had been at that level. I look on 75% approval as mediocre--as 'Cees.' A big piece of this process is communication, not only about what happens here, but how can we set up an ongoing communi-cation system with parents so that we can continue to improve. I think this is applicable to every developing curriculum in the district and in the nation, not just this science program.
>
> Parent: This is our first year here. We were not involved with any of the previous communication that went on. I really do not know the direction of the science program. I know I am happy with what I see, but I think I'm not in the minority when I say I really do not know what is going on. That might be an important focus for us--to be sure that parents really understand what the curriculum is trying to accomplish.
>
> Teacher: That is something that I would agree with. Parents can

> be valuable resources in terms of trying to do that. What would you like to see come home in terms of a communication from the department or the individual teacher in regard to what will happen in the program--maybe that year--different types of activities--expectations--things like that--because it is so different from the traditional approach?

Prior to this dialogue, members of the Team had addressed all of their comments to me, and I had responded in each case. The previous discussion was the first direct communication between members of the Team, and it seemed to set the issue of parent and teacher roles to rest.

The members of the Project Improvement Team were clear from the beginning that while parents and teachers on the Team would work together, that there were to be distinctions between roles in some regards. During their initial meeting, a parent stated that she believed the parents should state their concerns but that she did not believe that parents should be directly involved in the revisions. When the discussion turned to the possible misalignment of the middle and high school science programs, a parent was quick to comment that this was a "...school or a teacher to teacher problem" (Project Improvement Team--March 30, 1995). This seemed to indicate that the parent believed that the topic should be left in the hands of the school's educators.

Drawing distinctions between teacher and parent roles on the Team was addressed again during the third meeting of the Team. A discussion arose regarding the respective responsibilities of parents and teachers in the checking of students' homework. A parent offered the suggestion that all teachers should check homework in a specified way. Another parent interjected:

> All of these are very detailed suggestions, and we are crossing that line into telling teachers how to teach. We said we would not do that.... We can say we would like support, but it will be up to you to decide how to do it because you are the ones who have the expertise with the children. You are the ones who are trying to groom some independence. We'll never get away from the variations in kids and parents--different resources, backgrounds, abilities. We can make all of these suggestions, but there is still a range. I don't mean to say that is not a good suggestion. I don't feel way, but I think the purpose of our group was to take all of the suggestions and make general suggestions, perhaps under these categories, to improve the program as a whole, not to get into the details. (Project Improvement Team--April 27, 1995)

During the follow-up interviews, this topic again arose, this time with two separate parents in response to my final interview question in which I invited each to add any final thoughts about the process of involving parents in our science program. The first responded at length:

> Just the one thing that we touched on the phone the other day--to make it abundantly clear both to teachers and to parents where the line is between the two, and that we are not here--nor should anybody misconstrue that we are here--to oversee teachers or tell them how to teach or critique their teaching or any of that sort of thing. We are here to help them--to augment their work and to get information passed back and forth between the parents and the school. We don't want to give parents the idea that they have more power than that, but to welcome them at the same time to give what we would like to have from them, and to have teachers understand that parents hopefully, will know that line and not cross it. There is always that--the more parents become involved in schools, the more you need to begin to deal with those issues. I've seen parents get the sense that because you ask for input that their input will be taken. I'm delighted to be able to give input, but I understand that it will be factored in with a number of other pieces of information and may or may not be used. The parents have to understand that it is being looked at, but if they don't use it, it is not because they did not care. (Interview--June 8, 1995)

A second parent contributed the following reflection on the issue of parent-teacher boundaries:

> I do not think we overstepped our bounds because no one came with a grudge. If there was someone in the group, I did not pick it up. But then I am not always the most perceptive person. No, I felt we were all there to work together. Not that we came with the idea that the science program was falling apart or that we had to do something about it because our kids are not making it. The program is good, but there are some minor changes that we can make suggestions for so it will be just that much better. (Interview--June 8, 1995)

I reflected on the phrase "overstepped our bounds" in terms of both Deming's principle regarding breaking down boundaries between staff and my efforts to establish a collegial, friendly, and friendly climate for the Team. It appeared that Team members came to the Team with preconceived notions about appropriate roles for parents in curriculum development.

Feelings about the Parent Involvement Process

In order to determine the emotions that Team members experienced during the parent involvement process, and specifically about their work on the Project Improvement Team, I asked during each interview, "What three adjectives would describe how you feel about your involvement in the development of the science program? Did you feel this way when you began your work on the team?" The descriptive phrases they provided additional hints about their attitudes regarding parent involvement.

The adjectives that Team members used to describe their feelings about their involvement in the science program were, with one exception, totally positive and covered a wide range of emotions. The one descriptive phrase that was not positive was "frustrated at times" which was contributed by the teacher on the Team who was new to the school and to the science program. She also used a number of positive adjectives in describing her feelings about the process. These included: "wanted, needed, helpful, good, powerful" (Interview--June 13, 1995). She had spoken of her newness to the program as her biggest contribution to the program at another point in the interview. I believe that her frustration was due to her lack of familiarity with both the content and format of the science curriculum and well as relative lack of experience with parent involvement efforts.

Team members contributed relatively few descriptive words or phrases (Table 5) but several were used by more than one individual. In terms of Glasser's list of basic human psychological needs (power, freedom, fun, belonging), the modifiers that were contributed by Team members met at least two of those. The fact that all but one were positive speaks to the positive climate that seemed to pervaded the meetings of the Project Improvement Team.

Process of Parent Involvement

There were three interview questions that were designed to elicit information from parents and teachers regarding ways that they had been involved, as parents, in schools. These included:

> Do you know of other schools that have involved parents in the development of school programs? If so, in what ways?

> Prior to working with our Project Improvement Team, in what ways have you been involved in schools?
>
> What previous involvement have you had with this school?

In addition, some data on prior involvement in schools was recorded during meetings of the Project Improvement Team. Therefore, the data on the prior involvement of Team members in schools were obtained both directly, from interview questions, and indirectly, from Team discussions.

Table 5

Descriptive Words and Phrases

Descriptive Words and Phrases	Frequency
satisfied	3
positive (Interviews of June 7, 8, and 14, 1995)	3
good (Interviews of June 8 and 13, 1995)	3
sense of belonging	1
important	1
supported	1
powerful	1
wanted	1
needed	1
helpful (Interview - June 13, 1995)	1
excited (Interview - June 16, 1995)	1

In the interviews parents professed not to be aware of involvement efforts other than those they had experienced personally. However, several had been involved at a number of levels. One mother, a chemical engineer by training but presently not employed outside the home, was the outgoing president of Parent Teacher Association one of the town's elementary schools and had also served on the district's committee that studied gender equity (Transcript of Interview--June 8, 1995). Only one other parent mentioned PTA, and this was only in passing; she had attended some meetings but had never been very active. However, she had been working for several years as a volunteer parent editor at the publishing center at one of the elementary schools in town. This brought her into the school on a regular basis to help individual students edit and word process their writing. In addition, she had a degree in special education and had been substitute teaching for several years in several districts (Interview--June 8, 1995).

Another mother was working as a teacher aide in an elementary school within the town and was also working on a master's degree in special education. Previously, she had volunteered at her children's elementary school and had also served on a committee that was studying school transportation (Interview--June 7, 1995). The fourth mother had also served as a volunteer in another of the town's elementary schools, helping in science classes (Interview--June 5, 1995). She also had a degree in education as well as experience as a substitute teacher (Project Improvement Team--April 13, 1995).

Therefore, three of the four mothers who were members of the Project Improvement were trained as teachers and all had been involved in elementary schools in varying capacities, mainly as volunteers. However, the fathers on the Team offered different profiles. The first had extensive experience in the fields of electronics and computers and was beginning a new position as a support engineer in the computer field. His previous involvement in schools included working on the Middle School's annual PTA sponsored fund raiser, as well as creating a home made balance from tomato paste cans for his son's elementary science class. He had also been involved with children in various coaching roles in town (Interview--June 14, 1995).

All of the other fathers were employed in science-related industries. One had served on the district's technology committee. In his previous community, he had been a member of a parents' group that had, with the endorsement of the school board, developed a program that brought science professionals into classrooms and also provided after school hands-on science experiences for children in that district's elementary schools (Interview--June 8, 1995). Another father had not been involved in schools before but reported that he came from a teaching family; his father and brother were both teachers (Interview--June 2, 1995).

The fourth father had had extensive experiences in schools, both as a science teacher and a parent volunteer. Having earned a doctorate in physics and currently employed as a physicist in the aerospace industry, he reported:

> I come from the private school sector, Catholic schools. We paid for the school. The idea that you come in and paint the walls. One year we set up a brand new kindergarten, and the teacher decided, 'Wouldn't it be nice if these kids had some computers?' and we turned around, and there was $5000 worth of computers in there. We have always assumed that if we do not pay for it, no one else will. The public school, the idea that we are advisory to a school system with a budget and a statewide funding agent with deep pockets is very strange to me. I more or less expect parents to come in and do things, but I find that not to be part of the public school tradition. (Interview--June 9, 1995)

Therefore, all of the parents on the Project Improvement Team were trained professionals in the fields of education, technology, or science. Seven of the eight had previous involvement in schools--serving on district committees, volunteering in classrooms, contributing to science programs. The parent group seemed unique in the many and varied strengths they brought to the Project Improvement Team.

Procedures to Involve Parents in Curriculum Development

The procedures that I used for involving parents in the development of the science program were based on my studies and previous work with the processes and tools that are ascribed to the systems management/ school change approaches of Total Quality Management (TQM). I had a clear vision of an overall plan for the study, but specifics, by necessity, evolved as the study progressed. For example, while I anticipated that I would use selected Quality tools, I had to wait until after the data were collected to see which tools would enhance its presentation and analysis.

I had visualized that the principles and tools of TQM would be driving forces of the study. My initial plan (Figure 3) had two overlapping purposes: a school project to involve parents in the improvement of the school's science program and an educational research study of parent involvement in curriculum development. The school project became the basis for the study. Furthermore, my previous attempts to involve students in curriculum improvement had led me to believe both that data that is generated by surveys is very limited and that focus groups are useful for collecting clarifying information. These prior efforts had included both student surveys to determine their perceptions of the science program and follow-up focus groups to add depth and clarity to the survey data. However, my work with students had stopped with their providing of information about their perceptions of the science program.

In this study, I wanted to leave the door open for parents to become involved in the development of the science program in other ways, but I could not predict directions this involvement might take until I was actually involved in the study. I did envision a process where the numbers of parents who would be involved would decrease as the level of involvement increased, and that is what actually happened; 300 respondents to the parent surveys led to 37 participants in focus groups which led to eight parent members of the Project Improvement Team. The pilot of the parent survey had indicated that the time required to respond to the survey ranged from five to 15 minutes, but focus group participants were committed to a one-hour meeting. The members of Project Improvement Team attended five meetings over a two-month period, did a great deal of data analysis and planning between meetings, and became a fixture of the school in the following school year. The Team's work seemed to evolve as the study progressed.

Therefore, I planned Tier I of the study in detail and anticipated that parents and teachers would be likely to be good at providing information about their perceptions of the science program as well as the process of parent involvement. Beyond this, I had no preconceptions of what would happen when parents and teachers sought to collaborate in the reform of the science program.

Quality Principles. I found that several of Deming's principles informed the processes of the study. Two of them, "Create constancy of purpose for the improvement of product and service" (Walton, p. 55) and "Improve constantly and forever the system of production and service" (Walton, p. 66), provided the basis for taking a look at the school's science program and working to improve it (Tier I). Prior to the study, the teachers and I had agreed that the program had many strengths, but we also were aware of some parental concerns that were confirmed by the survey and focus groups. Parents had, through the study's surveys, provided concrete information that could guide improvement efforts. The data from the surveys and focus groups could be used to improve the science program, thereby satisfying parental concerns.

Two other principles, "Drive out fear" (Walton, p. 72) and "Break down barriers between staff" (Walton, p. 74), had special meaning for the study in terms of the importance of collaboration. I was curious to see what would happen if I provided a means to bring parents into the curriculum development process. Would parents and teachers be able to develop a collaborative relationship in an area that had previously been totally within the teachers' domain? Would parents be fearful of infringing on the teacher's territory? Would the teachers resent the parents for interfering? I decided to apply yet another of Deming's principles, "Take action to accomplish the transformation" (Walton, p. 86). I would do my best to move the process beyond sharing of perspectives to working together. In other words, I would "just do it" and see what happened.

Throughout the study, I attempted to "drive out fear" by maintaining a friendly and collegial atmosphere. I tried to "break down barriers" between parents and teachers by establishing an environment that I hoped would foster respect, open communication, honesty, and trust. The cover letters to both parents and teachers that accompanied the initial questionnaires were stated as invitations (Appendix A). Those who volunteered to participate in focus groups received personal telephone calls to schedule mutually convenient times. Follow-up letters confirmed meeting sites and times (Appendix H). Thank-you notes were sent to all focus group participants who volunteered to serve on the Project Improvement Team, those who volunteered but could not be included, and those who chose to end their involvement with the focus groups (Appendix H). I believe that the format of the invitations and follow-up notes established a relaxed and welcoming tone for the involvement process. It was my intention to have these communications establish a climate that could potentially satisfy the basic psychological needs of the participants: to belong, to be powerful, to be free, and to have fun (Glasser, 1986, p. 23).

I carried my efforts to "drive out fear" to room settings. I reserved the faculty workroom at the school for all of the focus group and Project Improvement Team meetings. This room contained a couch, comfortable chairs, a large coffee table, and a serving table. I ordered beverages and snacks appropriate to the times of the meetings, arranged the furniture in a circular pattern in advance of each meeting, and provided name tags (Researcher's Journal--January 21 and March 26, 1995). Prior to each meeting of the Project Improvement Team, I also prepared handouts and sent a memo that included both consensus statements for the previous meeting and the agenda for the next to each Team member (Researcher's Journal--March 26, 1995). These served both as member checks to ascertain if all Team members agreed with the consensus statements, but also to ensure that Team members would arrive at meetings focused on the work for the day. I believe the statements also validated the work of the members of the Team because they provided members with evidence that their perceptions and suggestions were important and would be utilized as well as that the Team's progress was being recorded and subsequently shared among all members of the Team. All meetings began and ended on time, a reflection of my effort to respect the many responsibilities of the parents and teachers on the Team.

It appears that my efforts may have been successful, for Team members exceeded my expectations in regard to working together. I had anticipated that parents and teachers would be able and willing to provide information. The study's research design had included surveys and focus groups for this purpose. My initial plan also included involving Team members in the process of analyzing the survey and focus group data. I also suggested that Team members might "Attempt to reach consensus on ways to resolve issues" (Project Improvement Team--March 30, 1995) and that they might consider communicating their work to other members of the school community. However, I did not anticipate that parents would wish to become actively involved in the science program which is what happened.

Examination of the consensus statements from Project Improvement Team meetings in March, April, and May (Appendices M, N, and O) showed that the Team members moved from philosophic and abstract concepts to concrete suggestions for improvement. The three March statements show that the members of the Team agreed that parent-teacher communication is important and that parents should be involved in curriculum development in several ways: expressing their ideas, analyzing data, and establishing priorities. However, all also concurred that the actual writing of the curriculum should be left to the teachers. After two weeks in which Team members individually analyzed the survey and focus group data, they identified two major issues for their work: consistency (organization and resources) as well as communication. They also began to list specific improvement suggestions under each of these categories.

Items listed under consistency included: hole-punching and stapling of matérials, development of unit summaries or content outlines, highlighting of key words, providing a separate notebook for science handouts, pre-numbering handouts to provide a clear order, and distributing the same packets of handouts to all children in each grade level. The communication issues Team members listed were: the history of the science program, its organizational plan, and the function of textbooks as resources only (Project Improvement Team--April 20, 1995).

By their fifth meeting, Team members listed six specific plans for improving consistency. These included:

> 1. The teacher members of the Team would share the Team's decisions with the other science teachers at the department's last meeting in June. The summer curriculum writing team would develop plans to incorporate the Team's suggestions either during the summer work session or en route as units were developed during the school year.
>
> 2. Team members would also present the notion of a separate binder for science handouts to the other members of the department at the June meeting. If approved, binders would be stocked in the school store.
>
> 3. Simpler consistency issues such as hole-punching and pre-numbering handouts in each unit (deemed "no-brainers" by members of the Team) would be implemented in all classes in the fall.
>
> 4. Teacher members of the Team would collaborate with the

English teachers to improve notetaking skills of students.

5. The parent members of the Team would facilitate the establishment of classroom libraries of science periodicals and articles for each grade level.[9]

6. Grade level meetings of science teachers would be reestablished to ensure equity and consistency for all students at each grade level. (Appendix O)

Team members also listed four plans for improving communication including:

1. Science Parents' Night would be held in the fall for the purpose of explaining the history of the program, its goals, the results of the surveys and focus groups, and the work of the Project Improvement Team to the school's parents. Parents' Night would also provide a forum to explain the work of the Team, introduce its members, and suggest ways that parents, teachers, and students could collaborate to enhance science education at the school.

2. I would prepare handouts for Parents' Night to reinforce the information that would be shared with parents. It would include a statement of intent, communication and collaboration to enhance science education at the school. A separate handout outlining parent, teacher, and student responsibilities would also be included. Separate one-page handouts would be distributed to parents who did not attend Parents' Night via Friday folders or the school newsletter.

3. I would contact the local newspaper to investigate the possibility of a feature article on the science program.

4. Names of members of the Team would be published in the school newsletter. A trouble-shooting procedure and form would be developed to encourage the school's parents to ask questions, seek advice, and voice concerns about the program. (Project

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[9] This parent involvement project was later expanded to include the development of a notebook of professional profiles of townspeople who have expertise in science-related fields and would be willing to serve as mentors, guest speakers, or in other human resource roles to enhance the science program. This will be described in greater detail under the last research question.

Improvement Team--May 25, 1995)

The fifth meeting of the Project Improvement Team was, by mutual agreement, the last of the school year. The decision to cancel the sixth meeting was based on a growing awareness of Team members that the science teachers had to tackle some of the tasks that Team members had listed for improving the science program before others could be addressed (Project Improvement Team--May 25, 1995).[10]

Quality Tools. My interest in Total Quality Management was also reflected in the Quality tools that I selected to organize and display the work of the Project Improvement Team. I had used Affinity Diagrams to organize the narrative data from the parent surveys (Tier I), but I also found these tools to be useful for sorting and categorizing the decisions of the Project Improvement Team, a means for "mapping the geography" of the issues (Brassard, p. 18). The Affinity Diagram of the Team's plan to improve the science program (Figure 5--details in Appendix P) included suggestions in three major categories: Consistency, Resources, and Communication. This Diagram seemed to help Team members to see relationships between their suggestions.

The transcripts of the audiotapes of the meetings of the Project Improvement Team showed that Team members often returned to previously discussed topics to add or clarify information. For example, the issue of gender equity surfaced during all five meetings of the Team, but it was not until the fourth meeting that Team members decided to treat it as a communication issue rather than attempting to determine ways that the program might be modified to ensure that both sexes would have equal opportunities. Until Team members began to work with the Affinity Diagram, it appeared that the gender equity issue was in a category by itself and that it did not fit into the categories of Consistency, Resources, and Communication. In fact, when I prepared a draft of the Affinity Diagram at home, I had kept the Post-It for the gender equity issue aside because I could not see its relationship to other issues.

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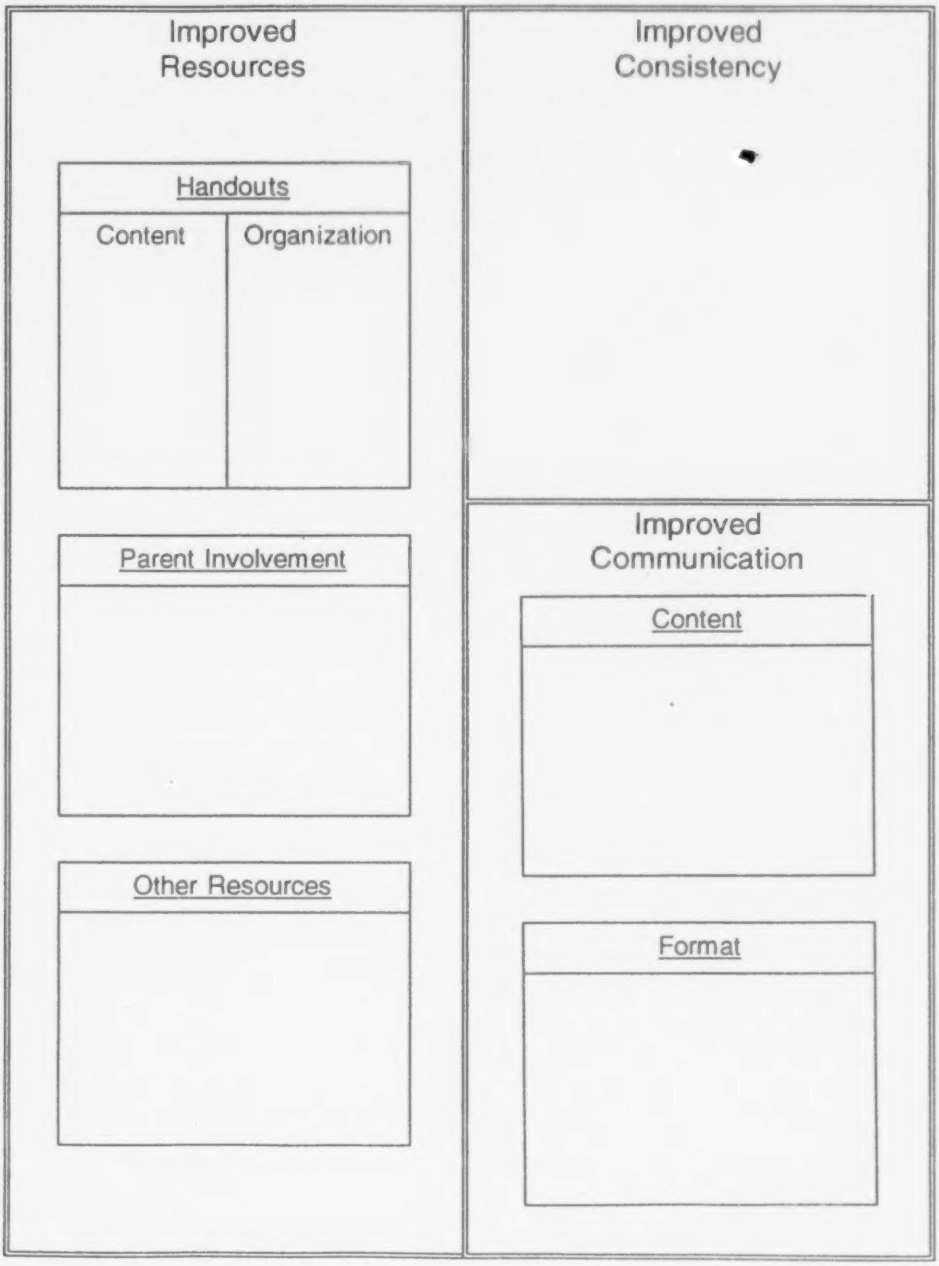
[10] The fifth meeting of the PIT was the official end of this study. However, the members of the Team have agreed to reconvene in the fall and continue their work.

Figure 5

Affinity Diagram

Project Improvement Team's Plan for Improving Science Program


Improved Resources
Handouts
Content
Organization
Parent Involvement
Other Resources
Improved Consistency
Improved Communication
Content
Format

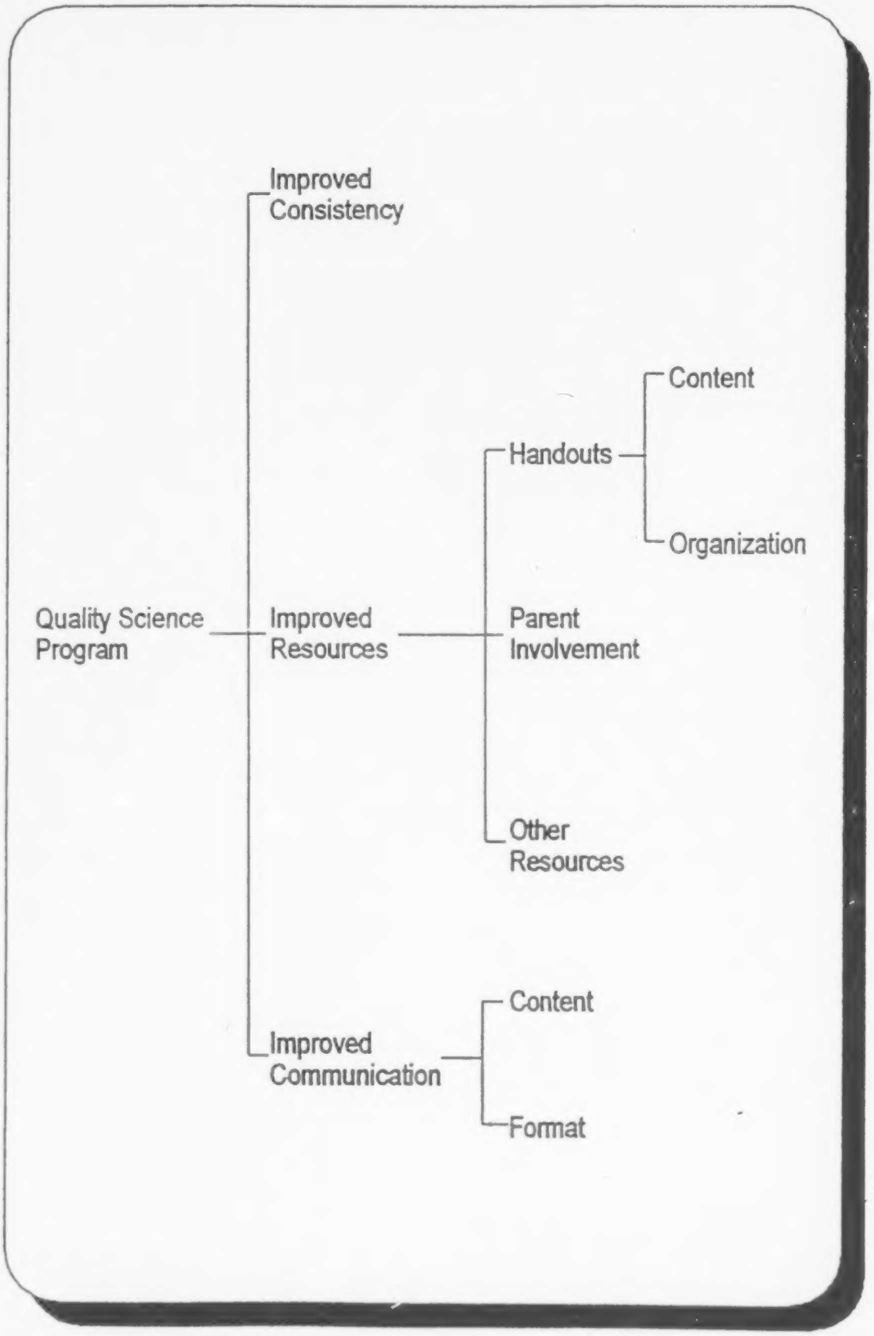
Then, prior to the following meeting of the Project Improvement Team, I prepared a Tree Diagram (Figure 6) containing the same information as the Affinity Diagram. Tree Diagrams are useful when implementation is expected to be complex (Brassard, p. 75). This format allowed Team members to examine the data from a different perspective and to begin to see who might be responsible for the tasks that were listed. It was also helpful for clarifying relationships and allowing Team members to begin to set priorities.

The Tree Diagram illustrated that the Team's improvement plan was complex and might not be achievable in one summer. Therefore, I decided to use another Quality tool, weighted voting, to establish priorities. I began by asking Team members to decide which of the headings should be considered for the weighted voting process. They decided that the Resources Category was too broad to be considered as one issue and that the subheadings (Handouts - Content, Handouts - Organization, Parent Involvement, Other Resources) should be considered as separate issues. The final list of issues that were subjected to weighted voting included: Consistency, Handouts - Content, Handouts - Organization, Parent Involvement, Other Resources, Communication.

The number of votes each Team member received was determined in the following manner: I divided the number of issues (six) in half (three) and added one. Therefore, the total number of votes each Team member

Figure 6

Tree Diagram - Suggestions of Project Improvement Team


Quality Science Program
Improved Consistency
Improved Resources
Improved Communication
Handouts
Parent Involvement
Other Resources
Content
Organization
Content
Format

received was four. These were to be cast with four for the individual's top priority, three for the second, two for the third, and one for the fourth. The final scores (Table 6) that resulted from the weighted voting process indicated that the two issues that Team members considered most important were Consistency and Communication (Project Improvement Team--May 11, 1995).

The question of who would do what task(s) remained. I attempted to develop two work matrices, one for the consistency issues and the other for the communication topics (Table 7). However, when I worked with the Team members at their final meeting and Team members attempted to assign tasks, we found that many of the tasks had to be completed by the summer curriculum writing team before others could be attempted. Also, the "no brainers" (Project Improvement Team--May 25, 1995) such as pre-numbering handouts would be the responsibility of the teachers at each grade level. It was clear that much work on consistency needed to be completed before the communication issues could be addressed. The Tree Diagram would serve to maintain the focus of Team members on tasks to be accomplished.

Table 6

Table of Weighted Voting Results

Issue	Individual Scores	Total Scores
Consistency	3, 4, 2, 1, 4, 3, 3, 1, 4, 4	29
Handouts - Content	2, 3, 3, 2, 2, 1	13
Handouts - Organization	3, 3, 2, 3, 2, 3, 1	17
Parent Involvement	2, 1, 4, 1, 2	10
Other Resources	1, 1, 2, 1, 2, 2	9
Communication	3, 4, 4, 4, 1, 4, 4, 1, 4, 3	32

Table 7

Work Matrix for Accomplishing Tasks

Task	Person Responsible	Expected Outcomes	Due Date

The use of Quality tools such as Affinity and Tree Diagrams seemed to provide the means to organize both the study's data and the thinking of the Team's members. Weighted voting served as an aid for prioritizing issues. I believe they were important to the study in terms of moving the work of the Team members forward.

Most Important Contribution to the Project Improvement Team

During the interviews, I asked parents and teachers on the Team to respond to the question, "What do you believe has been or will be your most important contribution to the development of the science program at our school?" Their answers included references to both areas of professional expertise and to personal qualities. In addition, the letters I wrote to each member of the Team at the conclusion of the Team's fifth meeting (Appendix R) reflect my perceptions of their greatest contributions. Two of the fathers on the Team worked for companies that had provided training in Total Quality Management. During the interviews, one of them cited his background in working with the Quality process as his greatest contribution to the work of the Team. However, he qualified his answer and offered two statements that reflected his awareness that the worlds of business and education are different and that what works in one environment may not work in the other:

> With manufacturing, it is very simple and straightforward. You have a product that you have to make. Education is not a product. It is a capability you are generating, and I am not sure how really applicable or directly applicable Juran is to education as it is to manufacturing. And, unless you have a very well-

> defined set of goals as to what that product output is going to be to education, it is really hard to apply Juran's principles to education.
>
> I think there may be too much emphasis on teamwork in schools right now. Teamwork is essential, but individual contributions are also an integral part of teamwork. Unfortunately, I see too much down-playing of the individual for the sake of the team. Our task group was particularly good because we allowed everyone to have an individualized input with a clear understanding of what the goals were. As a team we functioned with the intent of meeting those goals. It was a good balance. Where I see too much is where the team is more important than the individual. You lose sight of what you are trying to do which is to teach teamwork and achieving goals. (Interview--June 2, 1995)

The other father with a background in Quality Management said that he had not anticipated making any contributions, but that he had joined the Team to see what the program was about and to give his opinions. He added that he felt it was the teachers who were "going to make it happen" (Interview--June 8, 1995).

In my letters to these two Team members, I stated to the first one, "I appreciated your abilities to listen attentively, consider carefully, and then contribute insightful comments that frequently served as consensus statements." I did not refer to his expertise in TQM (Appendix R, Letter of June 3, 1995). To the other one, I wrote, "I especially appreciated your contributions in the area of Quality Management. We are still struggling with the applications of this business model to our school setting. In the course of our meetings, you were often able to ease this process for us" (Appendix R, June 13, 1995). It is interesting to note that I cited the personal qualities of one and the professional expertise of the other when both had similar backgrounds. Was this because the first had internalized the principles of TQM to such a degree that they became part of his personality?

Only one parent offered his profession, technology, as his greatest contribution (Interview--June 2, 1995), but I did not refer to this in my follow-up letter to him. However, I commented on technological knowledge in my letter to another Team member. I stated, "Your graphs that prioritized some of the data were ingenious and gave all of us a hint of the expertise that is to be found in our parent population" (Appendix R, Letter of June 6, 1995). She had not mentioned her technical skills in her interview but had cited her prior involvement in schools and knowledge of their workings as her greatest contribution (Interview--June 5, 1995).

One teacher considered her expertise in science, especially sharing knowledge she had gained in a summer institute, to be her greatest contribution (Interview--June 16, 1995), while another cited her lack of experience and willingness to work as her greatest contributions. She added, "I kind of could see the parents' point of view easier than some of the other teachers who have been doing this" (Interview--June 13, 1995). The fact that others appreciated her newness to the program was corroborated by others. Another Team member said, "The fact that she is new probably means that she has fewer preconceived ideas" (Interview--June 2, 1995). In my letter to her, I cited her willingness to take new ideas back to the classroom and try them (Appendix Q, Letter of June 18, 1995).

The most prevalent contributions cited by members of the Team as well as myself were those that involved personal qualities of Team members, especially communication ability. In my letters to Team members, I used the following terms: "contributed insightful comments" (Appendix R, Letter of June 3, 1995), "ability to express your ideas both succinctly and eloquently" (Appendix R, Letter of June 9, 1995), "willingness to speak your mind" (Appendix R, Letter of June 8, 1995), "unique ability to communicate with parents" (Appendix R, Letter of June 18, 1995), and "excellent listener but also a reflective thinker." To the last one I added, "On many occasions you helped the members of the group to focus on the forest rather than the individual trees" (Appendix R, Letter of June 11, 1995).

The parents and teachers also recognized the importance of their abilities to communicate with the other members of their Team. One said, "The best ideas are useless if you can't tell someone about it, and often people with expertise in a field can only communicate among themselves, their fellow experts" (Interview--June 7, 1995). Another commented, "There were a lot of ideas that were kind of fuzzy until someone, sometimes myself..." (Interview--June 14, 1995). Others stated simply "the communication thing" (Interview--June 8, 1995) and "ongoing communication is probably the most important thing" (Interview--June 8, 1995).

One of the teachers spoke at length about the importance he placed on communication and his vision of the role he might take in this regard. He said:

> I see myself doing that. Becoming a real spokesperson and being very involved in that initiation meeting that we were talking about having where we can invite parents who are interested about the program--to have like an Open House--just for them, specifically about the science program and specific questions that they have.
>
> I think being a link between the staff and the community. As a coordinator, I'd like to take a large role in making sure that the community at large is aware of what we are doing here at the Middle School. I don't think we have had enough publicity thus far about what we are doing. I am very proud of it. Every place I go, people are falling over themselves asking me questions about how we did it and how they can do it and everything else. (Interview--June 13, 1995)

The other personal quality that I mentioned in my letters To Team members was enthusiasm. In at least four of my 12 follow-up letters, I referred to the Team member's enthusiasm for either the science program or the work of the Project Improvement Team (Appendix R, Letters of June 17 and 18, 1995).

Ways to Improve the Parent Involvement Process

During the interviews I asked each Team member, "If we were to apply a similar process to another project, how might it be improved?" Two of the eight parents and one of the four teachers on the Team stated that they had no suggestions for improving the process. The teacher added that she felt that the Team's work had been very thorough and that none of the steps in the process should have been eliminated (Interviews--June 8 and 13, 1995).

Several addressed the issue of time, but their responses showed mixed reactions. One parent wished that the Project Improvement Team could have met additional times in order to prepare communications to the school's parents about the parent involvement process and the Team's work. He also felt that additional time was needed to pare down the survey data before it was to be distributed to parents who had not been on the Team (Interview--June 2, 1995).

One of the other parents cited the need for more time or more meetings. The parent said she had often thought, "It's too bad this session can't run a little bit longer." However, she added that the fact that each meeting started and ended on time gave a clear message to participants about the time commitment for each session; she also stated that she felt that one hour was an ideal length for a meeting (Interview--June 8, 1995).

However, two teachers felt that the Team might have reached closure in fewer meetings. One said, "I reflected on that and said, 'Maybe if we had skipped a big piece, we would not have understood it as well'" (Interview--June 13, 1995). The other commented, "I think that in order to do it the right way, it has to be done the way we did it" (Interview--June 13, 1995).

Two parents and one teacher suggested that involving more parents and teachers on the Team would have been good for communication. However, all acknowledged that 12 was a workable number and that more participants might have made the Team unwieldy (Interviews--June 2, 8, 13, 1995). One parent suggested that a parent should be invited to participate during the curriculum revisions and that this would result in two benefits: an additional viewpoint and a means for letting others know that teachers value the input of parents. Still another parent suggested that students should also have been involved, but then remembered that student surveys and focus groups had been held prior to this study (Interviews--June 8, 1995).

Two parents considered possible improvements to the surveys, one in terms of the format of the questions, the other in regard to the presentation of the data to the members of the Team. The first felt that some of the survey questions were too open-ended and might have been easier to answer if they had been presented in yes/no or multiple choice format (Interview--June 8, 1995). The other said that the data tables and charts that I prepared for the Team to use as the basis for their analysis contained so much information that she had had difficulty evaluating the data. She suggested that weighting the questions would have given Team members an indication of the importance of the question (Interview--June 5, 1995). This parent was the one who had taken the initiative to prepare graphs of results for the Team to use.

There were several suggestions for improving specifics of the Project Improvement Team meetings. These included:

> Be sure that everyone is at every meeting because the minutes of the meetings do not convey the emotions of the sessions. (Interview--June 16, 1995)
>
> Consider holding meetings in someone's home. (Interview--June 16, 1995)
>
> Try to use more Quality tools to consolidate the data. (Interview--June 16, 1995)

One suggestion seemed to convey that the interviewee felt that the parent involvement process she had experienced might have value for other departments at the school. She suggested, "Attempt to get other departments to adopt the process" (Interview--June 16, 1995).

In general, it seemed that the members of the Team were relatively satisfied with the parent involvement process. The few suggestions that they offered for improvements were in regard to procedural details.

Strengths/Challenges/Successes of the Parent Involvement Process

One of the questions that I asked during the individual interviews was, "What were the strengths and challenges of the parent involvement process?" The responses of the parents fell into three categories: the composition of the Project Improvement Team, the organizational strategies that were employed, and the maintenance of focus.

In regard to the compositions of the group, two parents mentioned both the diversity of backgrounds of its members and their commitment to both change in the science program and its success (Interviews--June 2 and 5, 1995). Another noted the openness that teachers demonstrated to the opinions of the teachers (Interviews--June 7, 1995) while another commented, "Right from the beginning we had no animosity. No one felt threatened. That worked out unusually well" (Interview--June 2, 1995). A father offered both the diversity of the team members and their outlooks, stating that he felt that "not everybody is on the same page" which he saw as a strength (Interview--June 13, 1995). Another seemed to support this view:

> I also felt that on the educators side that they were very open to ideas from the parent group. It was a good mix. It made me feel good, very welcome. I think all of our ideas were well-received. I loved seeing this, I really do, and I think this really strengthens your school system--when you can get a working group of parents as well as educators. I think that it only benefits our schools if we can do that. (Interview--June 5, 1995)

Others mentioned that a strength of the parent involvement process was its organization. One appreciated that the Team's meetings were at 8:00 a.m. which was convenient for everyone on the team (Interview--June 14, 1995). Another stated, "I thought it was very well managed.... I came out of the meetings with a new found awareness of how much so many of the people in that group had to offer. I did not expect so much useful insight...to come out of a group that size and that diverse" (Interview--June 9, 1995). The facts that the process was so structured (Interview--June 2, 1995) and broken down into manageable pieces (Interview--June 5, 1995) were also cited as strengths of the process.

The parent members of the Team also saw the fact that the structured approach of the parent involvement process enabled them to maintain focus on the issues as a strength of the process. One stated:

> I think that the biggest strength was your tenacity in not defining where we had to go. You kept us on task.... You made us come to the task or issues at hand. I was thinking that must have been very difficult for you. There must have been times like.... Could we just talk about this? Or, could we just talk about.... I mean you did keep us.... But there were many times I would walk away and think, 'Where are we going and what are we doing?' In this process, you couldn't do that. It was up to us to generate the list. I think that was very valuable. (Interview--June 7, 1995)

She also commented on the thoroughness of the process: analyzing the data from the surveys and focus groups as well as the commitment of Team members to put personal issues aside and address those that were indicated by the data (Interview--June 7, 1995). A second commented on the speed with which members of the Team identified the two key areas that needed attention immediately and that the parents and teachers agreed on these (Interview--June 8, 1995). Another felt that using the surveys as a starting point gave a defined set of concerns and opinions which established a focus from the onset; this initial focus led easily to goals and then to a plan (Interview--June 2, 1995).

Another parent noted that he had come to the group with a set of issues, namely money and equipment, that had been of concern when he had been a science teacher 30 years previously but that the data provided by the teachers indicated that these were no longer issues (Interview--June 9, 1995). Another stated that she felt that a strength of the process was that the Team had addressed most of the parent concerns, mainly because of its constant focus on parental issues (Interview--June 8, 1995).

The teachers on the Team also saw the strengths of the parent involvement process in terms of only two categories, the composition of the Team and the organization of the involvement process. One commented:

> ...the strengths of people bringing their expertise from their fields or experiences.... Everyone there really wanted to make a positive difference and to help and support.... What came through it all is that people were really there to make a positive difference in their kids' educations in science. I think their personal agendas disappeared as we continued. Did you notice that? My feeling is

> that we became a team, a cohesive team. (Interview--June 13, 1995)

The second strength cited by teachers was the organization of the parent involvement process. One teacher stated that beginning with the parent and teacher surveys provided an idea of what to look for and while it was a lot of work, it was good (Interview--June 13, 1995). Another stated that the process had been very concrete and that "...everything you did... helped us to focus, and I think we addressed everything that was on there" (Interview--June 13, 1995).

There were only three challenges cited by Team members in regard to the parent involvement process. The first was from a parent who said, "I think people were holding back a little bit" (Interview--June 7, 1995). The other two came from teachers who cited a need for more time (Interview-- June 16, 1995) and a desire to involve more parents in the work of the Team. However, he also stated that he recognized that involving more parents might have made the group unwieldy, but he wondered if a system of breaking up a larger group into smaller work groups might have provided a means for involving greater parent involvement (Interview--June 13, 1995).

Communication about the Work of the Team

I asked two interview questions in an attempt to determine whether the members of the Project Improvement Team had discussed the work of the Team with others or if outsiders had shown interest in the Team's work by asking for information. These were: "If I had been shadowing you during the time we have been working together on the Project Improvement Team, what would I have seen that relates to our work but did not take place during our sessions? Did you initiate these conversations?" My goal in asking these questions was to determine if people outside the Team had influenced the work of its members.

Two of the parents reported conversations outside of the regular meetings of the Team about the Team's work with other participants. Three reported that they had spoken of the Team's work with outsiders. One said, "I had conversations when people would ask specific questions or make specific comments about science." Another offered, "I managed to work in something about working to make science more uniform...." (Interviews--June 8, 1995). No parents recalled initiating conversations about the work of the Team.

On the other hand, three of the four teachers reported outside conversations about the Team's work, one with parent members of the Team. One stated:

> There were a couple of parents who were on the team that had come up to me at ends of the meetings when there was a little bit of time and expressed their excitement about their involvement and the fact that they really felt that this was an important piece to the science program improving. That made me feel good as well. After that conversation, there was another two times when they stopped me and asked me what I thought about the kids' not taking earth science at the high school and going right into biology, and so I quickly said that I didn't agree with it but that, hopefully, we'll change things somewhere down the line. They want to see this continue. (Interview--June 14, 1995)

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Two other teachers reported communicating with colleagues at the Middle School. They seemed to convey their excitement about the Project Improvement Team's work. The first stated that she had initiated the conversations because she "...was very excited about it--very enthusiastic." She added:

> I have definitely had conversations with my team members explaining how I felt that this Project Improvement Team was allowing us to be on the forefront rather than behind and always responding. It was a nice, fresh feeling to be initiating instead of responding all of the time. It was nice to have the door of communication open. It was nice to clear up the little wrinkles, to iron out wrinkles, that could have become and have become in the past, problems. (Interview--June 16, 1995)

The third teacher reported two kinds of conversations, ones that she had initiated as well as some by others. She described separate dialogues with two teachers who were in their first year of teaching at the Middle School and about their resulting interest in the Team's work (Interview--June 13, 1995).

It seems that the members of the Team either did not communicate much about the Team or did not recall such interactions with others. There are a number of possible reasons for this. It is possible that opportunities to discuss their work did not arise often, that they were hesitant to speak until their work was completed, or that their other responsibilities overshadowed the Team's work.

Hopes for the Science Program

I asked the following interview question in order to elicit information about parent and teacher perceptions of the potential effectiveness of the parent involvement process: "What are your hopes for our science program as the result of the parent involvement process (surveys, focus groups, Project Improvement Team)?"

Many of the parents' hopes for the science program focused on communication, both within and without the school. One stated:

> I'd like to see communication with the community. I really think that is an important part. I'm not sure that.... Anything else that you are doing you may not need me for, but I would like to see that the community at large sees what we are doing here and sees the value of it.
>
> If we can keep our parents a little bit abreast of what is going on, it is an age when children do not always communicate, and also parents are feeling that independence, that they have left, but they would like to know what is going on in the program, so some kind of newsletter or again, communication is a really big part of it. The more information that goes out, even on a limited basis, you are going to have more involvement because parents are going to see places they can jump in and help. I think asking for expertise -- people coming in for special classes. There is a vast amount of knowledge out there in the parent group that would love to be utilized but don't know what to do with their talents either. It is very hard, even with busy lives. I think some of that experience really enriches our children. (Interview--June 5, 1995).

Two parents contributed that communication should go beyond the school to the community. The first said:

> I feel very strongly that this should get out to people, whether it is the [local newspaper], flyers sent home, or open houses, or [the school's principal] standing up by the flagpole giving a speech. I really think the public needs to know that this committee did this and that these suggestions are going to be made and you are going to see some changes. (Interview--June 8, 1995)

The other suggested that the Middle School science program and the process

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we used to involve parents be shared with other school districts.

> I hope that all of this is presented to the Board of Education, to the Superintendent of Schools, and his administrative staff. They always talk about Quality process, and what I see of your charts up here that are from that area don't give me good comfortable feeling about Quality process. Quality process is what you have done here, and this is what I'd like to have them see--what a real Quality process program is, not just talking about it and putting charts up, but actually having a program established which everybody is involved in--concrete and moving forward, and giving them progress reports.
>
> From my point of view, when you want to have Quality process program, you have to have a program. You can't just have a chart that hangs up on every administrator's office. You have to have something that everybody is doing and that is being checked. When you go to my laboratory, a Quality process tells you, when you run an ICP metals analysis, you take zinc as the process control. Where are our references? Are the in that process level? If not, what have we done to check it? Here I see a program that is going to go a certain way and be rechecked. Are we moving in the right direction? Yes? No? This is where we are now. This is where we are going. I think more of that should be established. I also would like to see some sort of a program that is going to be written up by you and your staff to distribute outside of this district. I mean, I just think you can't just carry out a good program. You shouldn't just end it by doing it here. I think it should be made available to other school districts. If it works here, it will probably work elsewhere. A lot of people would like to see someone else who has gone through a process. (Interview-- June 8, 1995)

Three of the parents expressed the desire that involving parents in curriculum development would spread to other disciplines at the school. One suggested that each department send out a questionnaire to see what the parent members of the school community think of each of their programs (Interview--June 8, 1995). The second contributed the notion that implementing this process in other areas "would benefit the kids" (Interview--June 5, 1995), while the third spoke in general about the importance of communication in all subject areas as well as the benefits that could result if everyone were committed to the same philosophic goal (Interview--June 7, 1995).

Others focused on the content and delivery of the science program and how parent involvement might enhance the program. One expressed the belief that parents' working to augment the program by offering additional resources and opportunities for student (Interview--June 9, 1995). The notion of parents as resources was also addressed by a second parent who stated her belief that the science teachers at the school were well qualified and added:

> But the fact remains that because they are teaching they are not in industry or in other places where some wonderful things are happening daily. To have the parents who are in those fields be able to collaborate with the teachers who are teaching the material and give them the latest up-to-date information and some new information whenever it becomes available and get that to the kids is wonderful. If parents can understand their role as being that sort of--what would you call it--sort of a consultant kind of a role--to bring the science from outside to the teacher and the teacher can use that to the best advantage knowing how to educate children.... That would be awesome. We're getting there. (Interview--June 8, 1995)

One expressed his fear that there would be no follow-through for the work of the Team, that teachers have such demanding schedules that the Team's plan should be implemented slowly and thoroughly so that the teachers would not feel overwhelmed. He added that he felt that re-evaluation was necessary (Interview--June 8, 1995). Two others expressed their desire that the Project Improvement Team continue to work with parents. One suggested that an effort should be made to include parents of incoming sixth graders and to extend the Project Improvement Team concept to the elementary and high schools so that the science programs might be aligned (Interview--June 14, 1995).

One of the teachers also expressed concern that the work of the Project Improvement Team be carried to fruition. She stated:

> I hope that it comes to pass--everything that we talked about. I would not want all of this work to go for nothing. I hope that we can get the cooperation of everyone in the science department that was not on the committee. (Laughter) And, that we can actually do better communication and have the more concrete things that we talked about--our two main goals--with the organization and the communication. (Interview--June 13, 1995)

Another stated the belief that the work would continue:

> I think we are moving in the right direction. It's a nice, personable, positive attitude. The atmosphere.... There is a little sense of humor. There is joking. These people -- no antagonistics.... We are all in it together. I think the people are going to continue to come up with ideas, work on them, see them to fruition for the sake of the kids. I did not meet anybody in that group that conveyed that this was just one last thing that they were putting on their agenda to do--a should do thing. They wanted to be there. (Interview--June 16, 1995)

The third teacher said that she hoped that the parents would see what the teachers were trying to do (Interview--June 13, 1995).

Collaborators in Planning

Data Analysis

Parents demonstrated their willingness to participate in the analysis of the survey and focus group data beginning with the first meeting of the Team. I distributed copies of all 13 of the data tables from the parents and teacher surveys, and when I asked if Team members felt would feel comfortable analyzing the data, they all nodded (Project Improvement Team--March 30, 1995). Then, when I asked for volunteers, each to take home and analyze the open-ended data on needs and concerns of each of the five demographic groups, it was the parents who volunteered (Researcher's Journal--March 30, 1995). One of the teachers suggested that they spend the two weeks between the first and second meetings analyzing data, "then brainstorm and do weighted voting. Pick one thing, maybe two, and do a good job with those" (Project Improvement Team--March 30, 1995).

By the second meeting of the Team, it was clear that the members of the Team had become familiar with the data. One discussion between a parent and a teacher served as an example of the thought they had put into the analysis of one of the questions:

> Parent: I think one of the questions was worded incorrectly. Instead of asking for responses to the statement, 'The science program is exemplary.' Positive teacher responses averaged only 35 or 40%, so there is either a problem or the question was asked incorrectly.
>
> Teacher: I agree. I have that starred. The information for that question was far different than for any other question. That is the one that stands out.
>
> Parent: I suspect you asked the question incorrectly.
>
> Researcher: How might it have been worded?

> Parent: You should have asked parents to rate the science program on a scale of 1 to 5. You gave them an on or off answer to select, but some may have thought it was a good program but it is not exemplary. As a result, they would have to answer the question 'No.' (Project Improvement Team--April 13, 1995)

The parent who had been a member of the district's gender equity committee had volunteered to analyze the open-ended data for the parents of both boys and girls. She noted, "The only major differences I can see is that more parents of females feel a textbook is necessary, and parents of females also indicate that their daughters like science only if the teacher is excited about the subject" (Project Improvement Team--April 13, 1995).

One parent noted that she found the open-ended data to be more valuable than the data tables. She commented: "I found your charts to be the most important of all; they had a lot more to say. I did the charts first, then went to the tables. I wanted to read the comments before I looked at the data. For example, the textbook issue is not that clear" (Project Improvement Team--April 13, 1995). This prompted another parent to reply:

> I believe that the cry for a textbook is really more of a cry for better organization--for materials to be held together and some sort of way for the child to review. I went through and identified problems and possible solutions: binding? mapping? summary of steps teacher will follow? In a sense it may be necessary to compile some sort of a flexible text? The demand for a textbook is an indication of the frustration of some parents with those kids who are disorganized and lose things. Parents did not know how to ask for order but know that text will have it, so that is what they asked for. (Project Improvement Team--April 13, 1995)

A few minutes later, a third parent asked if she could pass something out. The "something" was a series of graphs which she had designed to prioritize the data in a visual presentation. She said:

> I did it differently. I had problems with the data, so I got my husband involved in it. It was difficult to weight what was important. My data was by school, but because we had one answer here and there. I think we got the same kinds of things. If you look at these.... Basically, you can see what the top ones were. Some of them do have comparisons. For example, projects.... I feel that the issues are communication and organization. The same kind of things came through. Also, on the last page--teachers--I did not put the numbers-- teacher dependent really should read science teacher dependent--12 responses to this--I think this goes with what Tom was saying. It's really how the teachers teach. It's not the textbook. It's how you use the material and how it comes across. (Transcript of Meeting of Project Improvement Team-- April 13, 1995)

This parent had obviously put a great deal of time, energy, and thought into the analysis of the survey and focus group data and had gone beyond my first expectation for the involvement effort, that Team members would be good at providing information.

Science Program

Parents not only contributed their perceptions of their concerns about what was needed in the science program, but they also offered concrete suggestions for ways to make improvements. Most of the actual collaboration about improvements occurred during the meetings of the Project Improvement Team, but the notion of a professional profile of parents who would serve as human resources for the science program (e.g., guest lecturers, mentors) arose during five separate focus groups (Focus Groups--February 22 and 23; March 7, 1995). This concept was ultimately incorporated into the Team's plan for improving the science program. Another idea that originated during the focus groups was that of a separate binder for each student for science (Focus Group--February 22, 1995; Project Improvement Team--April 13, 1995).

Specific ways to improve the science program emerged during the final four meetings of the Project Improvement Team. These included: pre-numbered pages of handouts in each unit, highlighting key words in handouts by using italics or bold fonts, content outlines for all units, classroom libraries of periodicals (Project Improvement Team--April 13, 1995), checklists of deadlines for large projects, information for parents on appropriate ways to help students with projects, accessibility to computer and research facilities in the evening (Project Improvement Team--April 27, 1995), rubrics for projects (Project Improvement Team--May 11, 1995), list of recommended materials for students to purchase (Project Improvement Team--May 25, 1995).

Communication

The parents and teachers also collaborated about the need for communication. The first data regarding the importance of communication came indirectly during the first focus group when I found that it was difficult to keep participants on task because everyone wanted to ask questions and be heard. Therefore, for subsequent groups, I inserted a brief description of the science program into my introduction. This resulted in more informed discussions because all participants understood the history of the science program before the focus group began. Furthermore, after the third session, several parents commented that they had learned a great deal and wished that more parents had attended (Focus Group--February 22, 1995). By asking questions, parents raised my awareness of their lack of information about the science program. I sensed that the focus groups served a secondary purpose--that of gaining support for the science program by informing the parents.

Helping parents to help their children with school work was raised as a concern (Project Improvement Team--April 27, 1995). Ultimately, two of the teachers on the Team volunteered to do a presentation on this topic at Parents' Night and to write a one-page list of suggestions for parents to be distributed at Parents' Night and to other parents in the school newsletter (Appendix S).

The cover letter that accompanied the parent and teacher questionnaires contained the promise that the resulting data would be shared with the parents. Team members decided that sending home all of the data would be overwhelming, but that highlighting major issues and having it available for interested parents to examine at Parents' Night would be appropriate.

A parent raised the issue of the need to establish a climate of openness and trust between parents and teachers. She said:

> One of the things that hits me about communication is that we have a list of things to do--I don't know how to phrase this--I think we need a climate in which to begin. We need to establish a basis of trust and commitment on the parts of the parents who are here and others to be able to face teachers and say, 'This is what we need.' Teachers need to able to say to parents, 'We need this from you and this from your children.' I think before any of those things are effective there needs to be some statement that is the

commitment.

> ...a statement that our commitment is continuous improvement is to continually improve the climate for continuous improvement of communication. I think, to some extent, that would address a lot of the issues that Ellen raised about teachers. I think if parents had a format--if they have a problem with a teacher--what do they do? If they do not feel they can go to a teacher, what do they do? If the door is opened, or if there is a way to address a problem, and you have faith in all of the people that are involved in the problem, that is to say, 'I believe the administration, if I come to them, will address my concerns. I believe the teacher will address my concern. I need you to believe that as a teacher you have a concern for me that I will address that with my child.' I'm not sure I am saying this quite the way I mean it, but I think this needs to come out. (Transcript of Meeting of Project Improvement Team--May 25, 1995)

Parents and teachers also identified ways that Middle School teachers had involved students in communicating. Some teachers regularly asked students to teach the day's lesson to their parents; others sent projects home for parent comments. Still others suggested that every issue of the school newsletter contain an invitation for parents who had questions about the science program to contact members of the Project Improvement Team. Another teacher offered the suggestion that students should obtain parent signatures on assignment sheets for projects so that parents would be aware of both the project and its deadlines (Project Improvement Team-- April 27, 1995).

Parents as Partners in Curriculum Development

By the fifth meeting of Project Improvement Team, the parent members seemed to emerge as partners in the implementation and improvement of the program. Team members had identified ways that parents might augment or enhance the existing program, and plans were underway in two realms, the science program and communication. Seeds for these plans had been planted during the Team's third meeting and had been nurtured since then.

"Science Stuff"

Parent and teacher members of the Team agreed that additional resources would be valuable for the science program. They also recognized that the district's budget had been strained by the recession and that no funds had been allocated for the coming year. The teachers had agreed that they had adequate materials to teach the curriculum (Project Improvement Team, April 27, 1995), but when a parent suggested that there was a difference between a "wish list and making do," they were quick to recognize her point. They cited some examples of resources that they had already tapped beyond the district's budget. These included grants, corporate, and community sources (Project Improvement Team--April 27, 1995). A parent reminded the other Team members that there was a need for additional journals and other science periodicals and suggested that even if the media center had enough, that classroom libraries would benefit students (Project Improvement Team--April 27, 1995). Another parent mentioned that many of the school's parents worked for corporations that subscribed to science and technology journals and that they might be invited to recycle them though the Middle School. Still another parent saw that this project could be organized by parents and volunteered for this task (Project Improvement Team--April 27, 1995).

By their fifth meeting, Team members decided to solicit requests from all of the science teachers for specific periodicals that they wished for their classrooms. They decided to prepare one questionnaire to collect the requests from teachers. Another would be sent to parents and would describe the periodicals that were needed and invite them to contribute their used issues to the school. They agreed that it was worth the effort to collect this information from both parents and teachers because, "You don't want too much stuff. You just want what you want and need" (Project Improvement Team--May 25, 1995).

During one of the interviews, a parent coined the term "Science Stuff" for all of the Team's efforts to enhance the science program. He described it in the following words:

> "Science Stuff" is meant to be the opportunity for interested parents...associated with the Middle School to provide other resources and stimulation as a way of broadening, or augmenting, or complementing the work of the classroom teacher. It is not intended primarily, as it were, to strengthen or to augment the teacher's curriculum. We have excellent teachers for that, and you have your materials. It is meant to provide the serendipity, the invitation to curiosity, that is addressed to the individual students.... we would invite the families of the students here, on a monthly basis, to bring in their Smithsonian magazines, their Physics Today, their Scientific American, whatever technical or scientific based information, and it would be in some kind of a random and spontaneous way left on tables for the students to pick up, browse through, take home, read, and so forth. Basically, the whole idea is to provide an alternative to recycling for this information.
>
> The second thing we would like to do is conduct a science

> technology survey of the people in this school here who have technical or scientific related backgrounds to understand who is in the health services, who is in the life science fields, and who is in the physical science fields, who have mathematical backgrounds. Then what we would do is ask them if they would not mind that we published them in a kind of a directory.... teachers could call on these people as resource people if they wished.... students come in and say, 'Miss So-and-So, I am very interested in this thing. Is there anyone in the community who could help me?' She could get on the telephone, 'Would you be interested in mentoring a student who is interested in batteries?' (Interview--June 9, 1995)

This parent offered two ways that parents could become partners in curriculum implementation, providing additional resources and preparing a professional profile of local people who had expertise in science related fields and would be willing to serves in various capacities as resources for the teachers and students.

Communication

Team members also saw the benefits of parents' and teachers' sharing responsibility for communicating both information about the science program and the work of the Project Improvement Team to the rest of the school's parents. To these ends, they agreed to hold a Science Parents' Night in the fall, to continue to meet in the following school year, and to publish their names in the school newsletter as contacts for parents who wished information about all aspects of the science program. Initial planning for all of these efforts was accomplished during the third, fourth and fifth meetings of the Project Improvement Team.

The concept of Science Parents' Night arose during the Team's final meeting during a discussion of ways to inform the school's parents about the data that had been collected via the surveys and focus groups. Everyone agreed that sending home large numbers of charts would not be as effective because few parents would take the time to study them. During that one meeting, Team members agreed that handouts describing the science program would be prepared for distribution at that meeting and would also be published afterwards in the school newsletter. They also expressed the desire that the education reporter for the local weekly newspaper be informed of the meeting and invited to attend. Some of the data from the surveys would be highlighted in the presentations which would involve both parents and educators, but all of the data tables and charts would be posted for those who wished to examine them carefully. They also agreed that all parents of sixth through eighth graders would be invited to Parents' Night the first year, but that similar evening presentations would be planned for parents of incoming sixth graders and students new to the school in future years (Project Improvement Team--May 25, 1995).

The notions of an ongoing Project Improvement Team and publishing the names of the Team's members as informational resources for other parents at the school arose during the Team's third meeting. One parent suggested:

> I have something else that was never really discussed in a group but was discussed by some parents as we were walking out. Under improved communication, and this is an after the fact kind of thing, if we could assemble a portion of this group, not

> necessarily even the present members of this group, but a couple of teachers, and a couple of parents and yourself--once or two or three or four times per year--depending on what is going on--to talk about what is going on--have perceptions changed? Is there anything else we can do to oversee some of the communication that is going home? Names of parents and teachers who are involved in the continuum of science improvement to be published in the "Lion's Roar" as resources parents can go to for a question that is not specific to a particular child or class? This could be a resource if there was something about the program that they did not understand or if there were things they felt were missing. They'd have a place to go, and we would have input coming in on a regular basis, not just an isolated survey, that would be useful. We could get together whenever we feel there is a need to see if we are successful or if we need to change tactics. Then, you would not need to do a complete overhaul. (Project Improvement Team--April 27, 1995)

The parent members of the Team ultimately took on several responsibilities that may be indications that they had emerged as partners in curriculum implementation. First, they offered to help with the planning of Science Parents' Night and also to do some of the presentations. Second, they suggested that the Project Improvement Team continue into the next year and became prime movers in this regard. Third, they offered themselves as resources for the school's parents by publishing their names and telephone numbers in the school newsletter and inviting parents to contact them about anything regarding the science program.

Discussion of Findings

What happens when parents and teachers seek to collaborate in the reform of a science program? The answers to this question seem to lie in four arenas: the parent involvement process that evolved, the roles that Team members assumed, the attitude changes that they exhibited, and their perceptions of the involvement process.

Process

In my attempt to provide meaningful parent involvement, I spent a great deal of time laying the groundwork for the study. Initially, I saw Tier I only as a preparatory phase for Tier II. However, as the study progressed, I saw that the Tiers were intertwined.

Tier I was important for two reasons. First, the parent and teacher surveys and the parent focus groups provided the data that set the direction for improving the school's science program, the work of the Project Improvement Team. The research question that I had eliminated early in the study became the focus of the work of the Project Improvement Team which constituted Tier I. Second, the process of analyzing the data became a means for engaging the parents and teachers in an involvement activity that was meaningful to them because of their shared interest in the science program.

Tier II, the study of parent involvement, relied heavily on Tier I. Both levels of the study were important to me--Tier I because of my commitment to providing our students with an exemplary science program, Tier II because of my interest in parent involvement. In a sense, while Tier I informed Tier II, the reverse is also true. The data from Tier I provided the data that engaged the parents and teachers in a meaningful shared experience. Tier II, the process of parent involvement, appeared to lead to the enhancement of the science program.

In retrospect, I believe that the processes of developing the survey questions, collecting and organizing the resulting data, and determining focus group questions might also have served as means to engage Team members. However, these endeavors were very time consuming and could not have fit into the time frame of the study. Whether Team members, most of whom had full-time jobs, would have been able or willing to tackle these Tier I tasks is open to conjecture.

The study also offered opportunities for me to attempt to apply some of the principles and tools of the Quality Management process to a school setting. It allowed me to observe how the parent involvement process would evolve and to see what worked and what did not. The most important thing I learned was that I needed to select those principles and tools that might best benefit the process of parent involvement. Rather than looking at the study from a Quality Management point of view, seeking ways to apply Quality Management principles and tools, I approached the study from a parent involvement perspective, along the way identifying Quality Management principles and tools that might enhance the process of the study. Ultimately, I focused on the concepts of continuous improvement and involvement as primary principles to guide the study.

I also tried to model aspects of the Quality Management process in my interactions with Team members by attempting to establish a comfortable environment which I hoped would enhance the likelihood of successful collaboration. This was my way of attempting to break down the barriers, another of Deming's principles. I chose a setting where distinctions between parents and teachers were minimized; the faculty workroom seemed to be more neutral than either a classroom or an office. Furthermore, I provided snacks and beverages that were appropriate to the meeting times and attempted to recognize the contributions of each member of the Team by including a summary or consensus statements of their last work session with the agenda for the next.

Several Quality Management tools seemed to help with organizing and presenting the data. I employed Brainstorming extensively and recorded responses on flip charts, a strategy that served both as a member check and a validation the responses of participants. Affinity Diagrams provided the means to organize both the survey data of Tier I and the parent involvement data of Tier II. I found the vast amounts of data that were generated at both levels of the study to become manageable when the data was organized into Affinity Diagrams. I also discovered that I had to resort to rather old-fashioned ways of color coding, cutting, hand sorting, and pasting the data onto huge charts because one computer screen could not possibly accommodate the many categories of data that I had to consider at any given time. I imagined that I would have needed 10 or 12 computer screens, each measuring approximately three-by-three feet and operating simultaneously on one wall to be able to utilize technology to sort the data of the study.

Another Quality Management tool that seemed to enhance the study was the Tree Diagram which I used to provide a second perspective of the improvements to the science program that were envisioned by the members of the Project Improvement Team. It allowed Team members to see connections between categories of data. Weighted voting, a fourth Quality Management tool, then provided a means to prioritize the data and direct the attention of Team members to those issues that should be addressed first.

One Quality tool that did not prove to be effective in this study was a matrix that I designed for the purpose of developing a work plan. It is possible that time was a factor in this regard. I prepared the matrix for Team members to use during their last meeting, but when they attempted to assign duties, they decided that many of the suggestions for improvements had to be instituted by the teachers on the curriculum writing team before steps could be taken to develop plans for communicating with the school's parents. Perhaps presenting the matrix in September after this work had been completed instead of June would have been more timely, but this plan did not fit into the time frame of the study.

The parent involvement process that was suggested by this study drew from the principles of Quality Management but evolved as the study progressed. Beyond the surveys, focus groups, and initial meeting of the Project Improvement Team, I could neither plan nor project what would happen when parents and teachers attempted to work together to improve the science program.

Roles

The parents and teachers who were members of the Project Improvement Team appeared to assume three major roles. First, they became providers of information, contributing their views both directly through surveys, focus groups, and individual interviews as well as indirectly through the audiotapes that I transcribed of the Team's meetings. I had anticipated that both groups would be comfortable working together as providers of information. In this regard, they offered their perceptions of the relationships of the demographics of the survey and focus group samples to the parents' perceptions of the science program. They also stated their opinions about the strengths and weaknesses of the science program. Furthermore, they contributed many insights into the process of parent involvement: its strengths and challenges, their feelings about it, and ways to improve it. They also described their perceptions of their greatest contributions to the process.

I neither anticipated nor planned for the other two roles that seemed to emerge as the study progressed. These appeared as the members of the Project Improvement Team worked together. The second role, collaborators in curriculum planning, became apparent during the Team's initial five meetings. In this regard, parents worked with teachers to analyze the survey and focus group data, to identify aspects of the science program that they believed needed improving, to brainstorm strategies to address these issues, and to plan ways to communicate the Team's work to the school's parents and teachers. As collaborators in planning, Team members worked together to analyze data about the science program, to identify concerns and prioritize them, and also to develop two separate but related action plans that would address the issues that had been raised. These included schemes for providing greater consistency in the science program as well as enhancing home-school communication.

Finally, the parents and teachers on the Team seemed to go beyond the sharing of information and collaboration phases when they began to share the responsibilities for both enhancing the science program and communicating with the school's parents. In this regard, they presented themselves as a united home-school team in the third role that emerged, partners in implementing and improving the curriculum. It appeared that the parents both sought and accepted responsibility in two areas, program enhancement and communication improvement. Program initiatives that the parents offered were grouped together under "Science Stuff" and included classroom libraries of periodicals, professional profiles, evening availability of research and computer resources for students, and "fun nights" in which students might experience science concepts in new ways. Communication efforts centered on Parents' Night, school newsletter articles about the science program, continuing the Project Improvement Team into the subsequent school year, and parents offering themselves as resources for other parents. All of these new enhancements to the science program were suggested during the Team's five initial meetings near the end of the 1994-95 school year; tentative preliminary plans were developed at the same time. Final planning for all of the components of "Science Stuff" and the communication action plan occurred in the fall of 1995, after the study was officially over. All aspects of both action plans will be implemented by the end of the 1995-96 school year.

Attitudes

In addition to these three shared roles for parents and teachers in curriculum development, the study also documented apparent changes in attitudes in both parents and teachers as the work of the Project Improvement Team progressed. In some cases, these appeared to relate to the levels of involvement of the individual members of the Team.

Team members were in general agreement about the appropriateness of roles parents might assume through their work on the Team. From the first meeting of the Team, parents and teachers concurred that some issues should be set aside for action by educators alone. For example, both parents and teachers agreed that while parents should feel free to state their views and augment the program, the writing and teaching of the science curriculum should be left solely to the responsibility of the teachers. When the issue of holding teachers accountable for implementing the new curriculum arose, it was also removed from the sphere of the Project Improvement Team and was set aside as the responsibility of school administrators. The fact that there was never serious disagreement about roles may be an indication that the parents and teachers on the Team approached their work with positive attitudes and unspoken promises to communicate and cooperate.

The uncertainty that some of the Team members experienced during the early sessions of the Project Improvement Team's work was evident in the transcripts of the first and second meetings. However, it seemed that this began to dissipate as the weeks progressed. It appeared that greater involvement paralleled greater trust and more open communication. During the individual interviews Team members offered a list of descriptive phrases that were totally positive and suggested that their involvement experiences satisfied their basic human psychological needs for love, power, fun, and freedom. One parent said:

> I am really satisfied. Ever since the girls started here, I've been kind of looking for a place, and it never quite worked out. I really feel that this is a positive thing for me to be doing. I feel it is an area where I have something to give, and an area where it has been well received. I am happy to continue with this. It has been all around--a very positive experience. (Interview-- June 8, 1995)

Another parent, the mother of an eighth grader, continued to work with the Team after her son graduated, even though he was her youngest child. This seemed to indicate a commitment that went beyond the personal level, for no member of her family stood to benefit from the Team's future work.

Perceptions

During the meetings of the Project Improvement Team as well as the subsequent individual interviews, Team members contributed their perceptions of ways to improve the parent involvement process well as its strengths and challenges. They also shared their notions about their greatest contributions to the Team and their hopes for the science program. I hoped that these data might offer insights into ways to improve both the process and the composition of future Teams.

Team members offered few suggestions when I asked them to propose ways to improve the parent involvement process. Although several addressed the issue of time, there was no consensus about whether the Team should have met more or less frequently. Some expressed a need for more meetings, while others felt that it might have been possible to eliminate some of the steps of the process and move faster. However, there was strong support for the fact that meetings started and ended on time. Lack of consensus surrounded the issue of the number of Team members. Several felt there should have been more, others suggested fewer. I attribute these varied opinions to individual preferences.

A number of Team members suggested that the parent involvement process be extended to other departments at the school, that parents be asked for input regarding mathematics, English, and social studies. They also supported the notion of sharing information about the Team's work both within and outside of the school community. I interpreted these suggestions to mean that Team members felt good about their work and believed that others might benefit from similar involvement efforts.

In terms of the strengths and challenges of the parent involvement process, I was surprised that some of the Team members identified the diversity of their backgrounds as a strength. My perception was that the self-selection process had resulted in a Team that was composed of highly educated people, all of whom were trained to be scientists, educators, or computer experts. One father's suggestion that the diversity was in outlooks rather than in professional station added a dimension that I had not previously considered.

Many Team members commented on the organization of the process. This may have been due to the fact that I had made an effort to keep everyone informed via consensus statements, agendas, and transcripts of meetings. They also commented on my "tenacity in not defining where we had to go" and keeping them on task (Interview--June 7, 1995). I attributed this perception largely to my use of Quality Management tools which allowed me to organize the vast amounts of data that were generated during the study.

The fact that a majority of Team members cited personal qualities rather than professional expertise as their greatest contributions to the involvement process was striking because of the professional profiles that Team members presented; I had anticipated that they would cite their prior training and experiences. The ability to communicate was the most prevalent of the personal qualities that were stated. The preponderance of responses citing personal attributes may have been due to Team members' growing awareness of how much they had learned about the science program and about each other.

The issue of communication surfaced again when I asked Team members to state their hopes for the science program. The majority of the responses reiterated their suggestions for ways to improve the process, mainly that the Team's work be shared with the rest of the school and with the others outside of the district. Communication was also one of the two areas of concern identified by the members of the Project Improvement Team in regard to improving the school's science program. This issue was also a primary focus of Team members in terms of the parent involvement process. It may be that the greatest strength of both Tiers I and II of the study was that communication about the science program and the parent involvement process was enhanced.

Chapter V

IMPLICATIONS FOR FUTURE PRACTICE AND RESEARCH

This study presented one process for involving parents in schools. Its findings seemed to indicate that if educators encourage parents to become involved in school improvement efforts, parents and teachers can find new ways in which they may work together. In this study, the school improvement effort focused on curriculum development. The shared parent and teacher roles that emerged were those of providers of information, collaborators in planning, and partners in curriculum development. Evidence from this study indicates that parent involvement can lead to enhancements to school programs that may benefit both teachers and students.

Relationship of Literature Review to Study

A common thread that was evident through all three sections of the study's literature review was that involvement of and collaboration between major stakeholders are important. Whether the stakeholders are called parents or customers depends on whether the investigator's professional domain is the world of education or business, but the fact remains that researchers in the worlds of parent involvement, school change, and science education reform all agree that engagement of all interested parties can enhance school improvement efforts. Beyond this commonality, each of these components of the study's literature review also contributed different insights into why and how parents and teachers can work together on school programs.

Parent Involvement

Prior to this study, researchers had established that parents and educators offer differing perspectives and priorities (Epstein, 1985). The data from the surveys and focus groups of this study seemed to support that notion. While parents and teachers generally agreed that the science program was sound, there were some concerns that were of greater concern to parents than to teachers. An example of differing parent and teacher perspectives was the data that related to the absence of a textbook, perhaps because the parents were working with their children at home where the multiple resources and expertise of the science teachers were not available to them. Without a textbook as a resource, parents experienced frustration when they attempted to help their children with homework or test preparation.

Other researchers have described school and community factors that had been present in prior parent involvement efforts. Prior to the study I had noted that our school already seemed to have these in place and might, therefore, be suitable for a new type of parent involvement. For example, parents at our school were already accustomed to being involved, and many of them had adequate financial as well as social resources at their disposal. This was especially true of the parents who became members of the Project Improvement Team, all of whom were professionals in the fields of science, technology, or education. The community's informal parent networks were also firmly established. All of these factors had been described in the literature as indicators of potential success in involving parents (Schneider, 1993, pp. 2 & 4).

The literature also indicated that parents could be valuable as information resources. Programs such as Chapter 1 (D'Angelo & Adler, 1991, pp. 351-353) and Parents in Touch (Warner, 1991, pp. 372-375) required parents and teachers to hold regular conferences in the belief that the sharing of information was an essential component of program success. In addition, many prior studies had been based on survey data (NELS:88; Schneider, 1993, p. 8) that had been provided by parents. This was another documented indication that parents are willing contributors of information. The vast amounts of information that parents contributed through the surveys and focus groups support the notion of parents as providers of information.

Previous studies had documented many kinds of parent involvement (Melaville & Blank, 1991; Gordon, 1979; Davies, 1987; Delia-Dora, 1979; Epstein, 1988). However, the only ones that were related to curriculum development focused on cultural diversity (Griego Jones & Marti, 1994). This study extended parent and teacher collaboration about curriculum to a middle school science program. It may, therefore, be of interest to educators who wish to ensure parent support for new programs as well as those who wish to explore possible new roles for parents as either collaborators in planning or as partners in curriculum development.

It is possible that this study also provided an extension of the work of previous researchers who have examined the kinds of involvement that parents and teachers have considered to be appropriate. A prior study found that teachers were most comfortable with involvement efforts that cast parents in traditional roles such as bake sales but that parents believed they should be involved in decision-making (Chavkin & Williams, 1987). In this study, it appeared that the attitudes of the parents and teachers who were members of the Project Improvement Team became more positive about the Team's work as their work progressed. It may be that parents and teachers who have experienced success in working together will support the concept of parent involvement in decision-making.

Similarly, the study may have extended the work of Becker and Epstein who found that parental attitudes toward teachers and administrators improve when schools take an active role in involving parents. This study offers a new arena for parent involvement, curriculum development, which may suggest an additional vehicle for both involving parents and developing positive parental attitudes toward their children's schools.

Therefore, this study supports previous research that established that parents and teachers offer different perspectives and that the presence of certain factors serves as an indication that parent involvement efforts might succeed. It suggests that parents may be valuable resources in the curriculum development process as providers of information as well as in two new roles, as collaborators in planning and partners in curriculum development. The study also suggests that attitudes of both parents and teachers vary directly with their levels of involvement; more positive attitudes develop as collaboration efforts progress.

School Change

The literature of school change informed the processes of the study by offering the rationale for parent involvement, that asking one's customers--in this case, the parents--what they need is the logical first step in satisfying them. It also contributed the concept of continuous improvement as well as a set of tools to expedite this collaborative process.

The literature of school change including that of Total Quality Management (TQM) offered both the philosophic background and concrete suggestions for involvement of stakeholders, which for schools, includes parents. Educators such as Roland Barth (1988, p. 131) and Michael Fullan (1993, p. 250) support the notion of family-school collaboration in school reform. Furthermore, the literature of TQM stresses the importance of empowerment, involvement, and shared responsibility (Deming, 1986; Bonstingl, 1992a; Glasser, 1992; Glatthorn, 1994; Imai, 1986; Walton, 1986), but it also provides concrete processes and tools for achieving these ends (Bonstingl, 1992c; Quality Improvement Tools, 1994).

In my efforts to involve parents, I relied heavily on Quality Management processes and tools in planning the initial stages of this study. The parent and teacher surveys, parent focus groups, and quality tools (Affinity and Tree Diagrams, weighted voting, and planning matrices) provided means for engaging parents and teachers in an arena in which I anticipated both groups would be at ease, as providers of information.

The study may have extended the notion of change as a process rather than an event (Fullan, 1991). Historically, curriculum change has usually meant the adoption of a new textbook. Continuous improvement, a principle of the Quality process (Deming, 1986; Imai, 11986; Bonstingl, 1992b), had special meaning for the school's science program in that its developers attempted to plan for ongoing rather than cyclical updating. This was a departure from past practices at the school which had relied on periodic adoptions of new textbooks every five to ten years and curriculum guides that were based on the textbooks.

Another tenet of Quality Management that was applied to the science program was that of involving the customers, in this case, the parents. The fact that the study involved parents in the improvement process, first by asking them to define their needs and later to collaborate in other ways, may suggest a new approach to ensuring customer satisfaction.

Prior to this study, most studies that have applied Quality Management principles and tools in schools have been reported in the area of school business processes. In addition, some researchers have related these principles to non-curricular areas such as school discipline (Gossen). While school change theorists have envisioned both parents and teachers as "school leaders in some ways and at some times" (Barth, 1988, p. 131), I was unable to locate any studies that extended the application of Quality principles and tools to curriculum development.

Glasser (1986) emphasizes the importance of designing school programs to satisfy the basic human needs of students: to survive, to belong, to gain power, to be free, and to have fun (p. 23). This study suggests that educators might also consider these same human needs in terms of the parents. The study may, therefore, be of interest to those educators who recognize the successes that have been noted in businesses that have applied Quality processes but have been searching for ways to apply its principles to school settings.

Science Education Reform

The major influences driving science education reform are in general agreement about the nature of programs that are most likely to be effective in preparing today's students for successful adult lives. However, they do not address the fact that the new paradigm may not be acceptable to parents because it is so different from the traditional science of their generation. This study suggests one way that the constructivist approaches may be explained to parents; it also models this new paradigm. Furthermore, it may offer insights into ways to gain parent support for new science programs.

Implications for Future Practice

> Parent involvement is important because parents know their own children. Their perceptions will, therefore, be different from those of the teachers who see the kids only in school. (Focus Group--February 23, 1995)

This statement, offered by a parent during a focus group, suggests that educators should recognize that students' work continues beyond the school day. Furthermore, it confirms that the way students present themselves at home may be a different picture from what they project during the school day. It also implies that educators have responsibility for ensuring that students can be full-time and self-directed learners, for recognizing that the school day does not end at three o'clock and that parents may wish to interact with their children about their studies.

Involving parents in curriculum development projects provides a means for sharing information about these programs. Answering questions before they are asked can be effective for preventing misconceptions from arising. Two-way communication with parents, asking for their input and providing information about school programs, is one arena that this study's process for parent involvement may be applied.

Educators who are examining Quality principles and tools as potential means to improve schools may be interested in how I applied the Quality process to curriculum development. Many districts have looked to the successes resulting from the application of Quality processes in the business world and have provided training in this philosophy and methodology. However, the business model must be adapted if it is to be applied in school settings. This study suggests a way to apply Quality principles and practices to the process of school change by involving the customers/ parents in a school project.

In the months that have passed since the study's inception, I have attempted to apply the same principles and processes to other school projects. As a non-curricular example, I have been facilitating a second Team of parents and school personnel that is working on a non-curricular issue, one that is focusing on aspects of the district's transportation system. With few modifications, I applied Quality principles and tools similar to those of this study to work with this new Project Improvement Team, this one composed of parents, the Transportation Director, and a representative of the bus drivers.

We began by establishing mutually agreeable meeting times with defined beginning and ending hours. At the first meeting, I outlined our goals: to determine the issues, to prioritize them, and to resolve them. I also stated that I would act as facilitator for the group's meetings and outlined a plan for our work: brainstorm and record all of the issues; collect information, prioritize, and develop plans to address them. Ultimately, we began our work by addressing issues that were obvious safety concerns and published an article in the school newsletter citing state statutes and school procedures that addressed these issues. We included all of the names and telephone numbers of the members of the Team as resources for other parents to contact to discuss potential concerns.

When I proposed that we design a questionnaire to collect data on parent perspectives regarding the school's transportation system from all of the school's parents, Team members suggested an alternative approach, including a request in the newsletter article for parents to contact any Team member if they had concerns. This invitation was based on the assumption that parents who had concerns might be more likely to voice them to other parents than to school personnel.

In the interim, we have categorized and prioritized the accumulated concerns of the Transportation Team's members. In this process, we used many of the Quality tools that were described in this study, Affinity Diagrams, weighted voting, etc. We are currently developing plans for one category of concerns, how to manage persistent troublemakers on school buses. The involvement process that was employed in the study's curriculum project seems to be equally applicable to transportation issues. It also seems to be effective for turning negative energy to a more positive direction by inviting those who have concerns to participate in resolving them. This attempt to involve parents in a non-curricular area offers hope that the processes that were employed in the study may be applied to other arenas of concern. It is possible that the processes of the study may be effective for both curricular and non-curricular school projects. It also serves as an example for districts that wish either to involve parents or to experiment with applications of Quality principles and tools may do so. The study may, therefore, have implications for districts that have provided staff training in Quality approaches but have not applied the training to school issues.

The study also has implications for practice in regard to curricula that contain approaches that are unfamiliar to parents. In the case of the study, the science program's reliance on multiple resources rather than a single textbook offered an example of paradigm that was unfamiliar to the school's parents. The parents who were least involved in the study, the respondents to the parents surveys, strongly suggested that textbooks were needed. The parents who were most involved, the members of the Project improvement Team, studied the issue, developed an understanding of the reasons for the multiple resources approach, and supported alternative ways of providing students and parents with additional reading resources.

The study may also have implications for school reform issues, sharing information and inviting involvement for the purpose of ensuring parent support for classroom innovations that might differ from traditional approaches. For example, educators might expect that parents might have concerns about those aspects of schooling that were not present when parents attended school. These might include alternative assessments, cooperative learning, and technology. Involving parents in the development of curricula may dispel the specter of the unknown and lead to shared understandings between parents and teachers.

A final implication for practice rests on the fact that parents have areas of expertise that can enhance school efforts. During this study, one parent, working independently, provided insights about the survey and focus group data that I had not foreseen. She applied her technological skills to prioritize some of the survey data, grouping the responses from the open-ended questions of the survey and then constructing graphs which arranged these in order. This delineated categories that had the largest numbers of responses, showing that the numbers of responses to the open-ended categories paralleled those of the short-answer questions. This gave other Team members evidence that there was consistency in parent concerns between both sets of data (Project Improvement Team--April 13, 1995).

Recommendations for Future Practice

After considering all of these implications for future practice I recommend that when educators develop and implement new programs, especially those that are unfamiliar to parents in terms of either content or pedagogy, they authentically involve parents as early as possible in the curriculum development process. Specifically:

- Gather and consider parent perspectives so that concerns may be addressed and parents will be empowered to support the learning process in the home environment. Children must be encouraged to be life-long and self-directed learners. It is important that learning be extended beyond the school day.
- Provide opportunities for authentic involvement such as engaging parents in data collection and analysis. These are meaningful activities that are likely to increase their ownership of school programs. Authentic involvement can serve as a model for constructivist approaches to teaching and learning.
- Researchers who are interested in expediting procedures should consider obtaining training in Quality Management principles, procedures, and tools. They offer one route for organizing, prioritizing, and presenting data.
- Determine and utilize areas of parent expertise. Both teachers and students will benefit from these additional resources.

Implications for Future Research

Demographics of Parent Sample

The site of the study offered a parent population that was largely white, middle class, and well-educated. Furthermore, the self-selection processes that were inherent in the study resulted in increasingly homogeneous samples as the study progressed. Initially, the survey was sent to all of the school's parents and was returned by 34 percent of them; the demographic data profiled respondents who represented a cross-section of the school's parents. However, the focus groups presented a self-selected group of parents who were focused on science education and appeared to be more representative of science professionals. This observation was supported by the fact that those who volunteered during the focus groups to be members of the Project Improvement Team were largely people who had been educated to be either scientists or educators. Finally, the eight parents on the Team were all professionals in the fields of science, technology, or education.

It is possible that the three roles that the parents and teachers seemed to share in this study might not have emerged in a school where the parents did not have educational advantages such as those of the parent members of the Project Improvement Team. Team members, parents and teachers, came together as equals with similar educational and professional attainments. Greater separation between parents and teachers in either of these regards might have resulted in a sense of intimidation in the less qualified group. This suggests a need for case studies in schools with more heterogeneous populations to determine the route that a similar process of parent involvement might follow with a more diverse group of parents and teachers. It might also indicate a need for further applications of the parent involvement process to other curricular areas, research that might indicate if other disciplines would attract groups of parents who were well-trained in the other disciplines.

District Initiatives

A second aspect of the study that has implications for future research rests on the fact that parents in the district had been encouraged to be active in their children's schools for many years and in a number of capacities. School governance councils had been established for several years in all of the town's schools. In the school that was the site of the study, parents had participated in previous non-curricular improvement initiatives such as school scheduling and the development of disciplinary policies and procedures. Parents were, therefore, accustomed to being involved in decision making.

It is probable that an attempt to do a similar study in a school that had not actively sought parent involvement might be greeted with suspicion and apprehension by both parents and teachers who were not accustomed to such interactions. Further case studies in schools with more varied prior experiences with parent involvement would be necessary to determine if the parent involvement process that was employed in the study might be applied to other schools.

Research Strategies

One aspect of the study's process had implications for researchers who need to collect both broad and in-depth information. The parent involvement process incorporated four distinct qualitative research strategies: a survey with both closed and open-ended questions, focus group and individual interviews, transcripts of focus group and Project Improvement Team meeting audiotapes, and a researcher's journal. It started with collecting data from the entire parent and science teacher population, narrowed to the 37 parents who participated in the focus groups, and narrowed still further to the eight parent and four teacher members of the Project Improvement Team. This meant that as the number of parents involved in the study diminished, there were more opportunities for greater richness and depth of data. The numbers of parents involved as the study progressed varied inversely with the quality and depth of the data that was produced.

The strategies that were employed were independent but enhanced each other. They presented different but related data, a means for triangulation. Future researchers might wish to examine this study's multiple approaches to data collection, selecting those that best fit their studies' needs for either broad or in-depth data, and then augmenting them with others.

Attitudes

Both the parents and teachers on the Project Improvement Team appeared to become more positive about the parent involvement process as well as the science program as their levels of involvement intensified. It is possible that the notion of greater involvement paralleling greater ownership might be observable elsewhere, but further investigation is necessary to determine whether the attitude change was unique to this study or if greater involvement is generally associated with more positive outlooks.

Potential Impasses

Prior to the study, I had anticipated that there might be issues regarding the science curriculum that the parents and teachers would not be able to resolve. However, I hoped that the training and communication that had raised awareness of basic human needs and the district's Success-Oriented School Model would lead to the cooperative and collaborative spirit that prevailed during the meetings of the Project Improvement Team. Whether the success of the study's parent involvement process was due to the district's emphasis on the Quality process, to the personalities of the members of the Team, or to some unknown factor is one of conjecture.

If an impasse had occurred, I would have reported it as such, and I would have attempted to determine reasons for the lack of resolution during the interviews of members of the Project Improvement Team. However, future researchers should consider potential roadblocks when designing their studies because it is possible that other Project Improvement Team members might not have the interpersonal skills that would allow them to work cooperatively.

The Quality Process

This study relied on some of Deming's principles as driving forces in the parent involvement process. It also utilized a number of Quality tools which, in retrospect, seemed to provide the means to organize and present the study's data and ensure continual progress.

Future researchers might examine other Quality principles to determine their value to educational research. In this study, rather than trying to apply the entire business model to a school setting, I focused on only four of Deming's principles, all of which seemed to be connected to establishing constancy of purpose and continuous improvement. These included:

> Create constancy and purpose for the improvement of product and service. (Walton, p. 55)
>
> Improve constantly and forever the system of production and service. (Walton, p. 66)
>
> Drive out fear. (Walton, p. 72)
>
> Break down barriers. (Walton, p. 74)

Therefore, I did not struggle with trying to apply principles that did not immediately appear to be relevant but selected those that seemed to be aligned with the study. Remaining are 10 other principles which other researchers may wish to examine to determine potential applications to other school situations.

Believing that the most effective approach was to determine what needed to be done and then select those tools that would best expedite the process, I tried to anticipate where the process was going and then search for those tools that were most promising. The fact that the work matrix that I had designed for the last meeting of the Project Improvement Team proved to be inappropriate supported my belief that the process could not be forced but had to be allowed to emerge and evolve; some things might work, but others might not. I believe that much depends on the setting, the population, the backgrounds and expectations of the participants, and the skill of the facilitator. Future case studies might investigate the application of other Quality tools to school projects and educational research.

Parent Involvement

Further research is also needed to determine additional arenas where parent-teacher collaboration might be appropriate or might be successful; some issues might be deemed inappropriate. In this study, the parents and teachers on the Project Improvement Team collaborated in analyzing data, planning for improvements, as well as implementing enhancements to the science program and improving communication. However, they also drew a clear line when they agreed that curriculum writing should be left to the teachers. They also set aside at least one other issue, that of holding the teachers accountable, as a "school problem" that should be addressed by the administrators and teachers. Team members, therefore, agreed that there were issues that were solely the responsibility of educational administrators. The parent Involvement process included the setting of limitations that were initiated by the parent members of the Team. This seemed to imply that the parents respected the professionalism of the teachers and that the educators had knowledge and skills that would enable them to write curriculum and hold each other accountable, two areas that should not be open to non-professionals. Through their participation in the process, they also helped to create it. Future studies might document whether similar limitations might be established.

However, there were some things that were unique to this study which might not be present elsewhere. The study was a natural outgrowth of the district's work with the Quality process and established an environment in which parent involvement was the norm. I had previous experiences with facilitating focus groups, designing surveys, organizing data, and analyzing it. This gave me insights into what approaches might offer the best opportunities for collaboration between parents and teachers.

This study investigated a new arena, that of parent involvement in the development of a science curriculum. Opportunities were offered for parents and teachers to collaborate in a way that might be said to be "authentic" or meaningful in that it was directly related to student learning; their involvement was both real and serious. It remains for future studies to determine other arenas for authentic parent-teacher collaboration.

Recommendations for Future Research

This study suggests many arenas that call for future research. However, several seem to suggest the greatest potential for influencing school reform efforts. For this reason, I recommend the following:

- Investigate applying the processes that were employed in this study to other curricular areas to determine if efforts to involve parents in other disciplines lead to more heterogeneous parent samples. This might shed light on the question of whether or not the homogeneity of this study's parent sample was due to the mystique that seems to surround science, to the publicity that has accompanied the development of national standards in this field, or to some other factor.
- Explore similar parent involvement strategies at the high school level. Historically, parent involvement has tended to diminish as children progress through the grades. A study focusing on science and technology at the secondary level is timely because of the publicity that has surrounded national science standards and the concept of backwards mapping.
- Repeat this study in different settings to determine if the attitude

changes that I noted were unique to this study or if greater involvement is generally associated with positive outlooks.

- Examine other Quality principles, procedures, and tools. Experiment with them, and select those that apply to specific research situations.
- Explore other content areas that might be suitable for authentic parent involvement as suggested by this study. I believe that involvement is the key to parent support for all school programs.

Lessons to Learn

Assumptions

This study was based on five assumptions. All of the assumptions were important because they provided the impetus that drove both Tiers, the school project and the study itself. They appeared to be validated to varying degrees as the study progressed.

During one of the focus groups a parent participant said there was "... a need to communicate the goals of the new program to parents..." because "... the program needs their support" (Focus Group - February 22, 1995). This statement seemed to indicate that this participant believed that parents' support was contingent on their understanding of the program and that school programs needed parental support. The first assumption of the study, *that parent support is an important factor in program success*, parallels this thinking.

Prior to the study, there had been little communication between the science teachers and the school's parents regarding the science program. While the teachers who developed the program believed that the science curriculum was sound, the program had not been fully explained to the school's parents, and some had expressed concerns. The study opened a dialogue between the parents and teachers on several levels. The surveys provided data that clearly defined parent and teacher perspectives of the program. The focus groups added to that data base but also began the face to face communication about the program that continued into the meetings of the Project Improvement Team, the individual interviews, and beyond the scope of the study. This process of parent involvement provided numerous opportunities to share information about the science program with the school's parents. While those who became members of the Project Improvement Team were ultimately the most informed, the study offered multiple opportunities for all parents to understand the program and be involved at varying degrees: the parent survey and focus groups, Science Parents' Night, and articles in the school newsletter. Furthermore, the process of the study may have delivered the message that the school's educators valued and respected input from the parents, an observation that was supported by the positive phrases that were provided by the members of the Project Improvement Team when they were asked to describe their feelings about the parent involvement process during individual interviews.

In the year that has passed since the conclusion of formal data collection, no parent has come forth with concerns about the science program. It appears that parental concerns about the program have been laid to rest. This observation supports the second assumption of the study, *parents who are involved in program development will be more likely to understand the program.*

The third assumption, that *parents will communicate their perspectives about the strengths and weaknesses of a program*, was supported by the vast amounts of data that were generated by the parent survey, focus groups, meetings of the Project Improvement Team, an individual interviews. In this particular study, the responses of the parents at all levels of data collection were voluminous and detailed.

The fact that the parent and teacher members of the Project Improvement Team continued their work beyond the stage that focused on providing information served as testimony that *educators and parents who are aware of each others' perspectives will work collaboratively to reach mutual agreement*, the fourth assumption of the study. The enhancements to the program that were initiated by the parents on the Team and were supported by the teachers provided evidence that *parents who have communicated their perspectives about a program and have worked collaboratively with educators will be more likely to reach mutually acceptable agreements and support the program*, the study's final assumption.

Authentic Involvement

Prior to this study, I recognized that the teachers who had invested time and energy in developing and implementing the school's science program had acquired ownership for it. This had grown over the several years that they had been actively engaged in curriculum writing. However, the rumblings in the parent community indicated that the parents neither understood the program's goals nor shared the teachers' sense of ownership. I attributed these voids to the fact that they had not been involved in the change process.

The questions of how and in what ways parents might be engaged opened the door to this study. I sensed that the involvement had to be a two-way give and take and that it was essential to reach as many parents as possible. I also knew that a working team would be unlikely to be effective if it contained more than ten or twelve people. Therefore, the study was designed to reach out to the entire parent population initially by asking all of the school's parents to share their perceptions about the science program. The focus groups provided a narrower parent sample, one that allowed for actual dialogue about the program. The Project Improvement Team added still another dimension, eight parents who were interested in the science program, willing to work to improve it, and cognizant of their roles as representatives of the rest of the school's parents.

Similarly, all of the school's teachers participated in the teacher survey, a representative sample of four became members of the Project Improvement

Team, and they communicated with the rest of the school's teachers. The fact that the Team members identified communication as one of the two improvement goals attested to their awareness its importance. The process, therefore, began with the entire parent and teacher populations, narrowed to a representative cadre, and then broadened to encompass the entire populations again. Furthermore, mechanisms for ongoing discourse and sharing of information were established to ensure that the communication channels would remain open.

The concept of authentic involvement was important to the study. If this had been a traditional involvement effort, parents might have been asked to raise funds to purchase equipment, to volunteer to tutor students, or to conduct an assembly or a workshop on a topic related to the science curriculum. While such parent participation can be valuable, it reaches only those who elect to participate and provides them with snapshots of the program rather than the big picture of science education today. Educators who espouse authentic learning and assessment recognize the need to provide opportunities for students to draw connections between school work and the real world. This study was an attempt to provide parents with an authentic understanding of science education: what it is, how it evolves, that it is not static, that it will continue to grow and change with the times.

The parents and teachers who were members of the Project Improvement Team stand together as ambassadors for the science program, sharing their mutual knowledge and experiences with each other and the rest of the school community. They have emerged as a cadre of involved and capable people, a nucleus for change.

Science Education Reform

The new paradigm for science education is calling for new roles for both parents and teachers. This study in many ways modeled constructivist approaches by providing opportunities for parents and teachers to construct their own understandings from the data that I collected and organized for Tier I of the research design. Active learning, hands-on opportunities, and exploration beyond the confines of the classroom are basic tenets of constructivism. The data analysis that was done by the members of the Project Improvement Team offered the means for Team members to develop their own constructs about both the science program and the perceptions of the parents and teachers who had contributed to the data bank.

Furthermore, the disequilibrium that parents experienced when they were faced with the new science program and which was reflected first in the rumblings in the community and later in the survey and focus group data was not unlike that which students experience when they are faced with new learning that does not fit their existing schema. Such disequilibrating experiences are at the heart of the new paradigm for science education and are also basic to constructivist learning theory (Saunders, 1992, p. 138).

Ownership

Constructivist approaches to science education indicate a need for new levels of parent involvement. This study revealed that the new paradigm for science education demands parent involvement and that involvement efforts can lead to both shared understanding and support for science programs. Furthermore, authentic involvement can lead to new levels of mutual respect that can result in openness, trust, and responsibility for student learning that is shared by parents and teachers.

There is a need to bridge the gap between the kind of learning that is proposed by science educators and the mechanisms that will involve parents in meaningful ways. In this study, the processes of surveying parents and teachers, running parent focus groups, establishing a Project Improvement Team, and facilitating the Team's efforts to analyze data, to plan for program improvements, and to implement changes became authentic involvement activities; Quality Management principles, procedures, and tools provided a philosophical framework and the means to expedite the process of parent involvement. The mechanisms that were employed modeled for parents what teachers were doing with their children.

Learning cannot be limited to either the school environment or the school day, especially in the field of science which is ever changing and growing. One academic period per day is simply not enough to prepare our students for life in the twenty-first century. The classroom must have open walls and connections to home and community.

If parents, teachers, and students are actively involved in the change process, they will share ownership for new programs. Traditional barriers between parents and teachers can be eliminated, and all major stakeholders can develop the understandings that will lead them to support programs. Ultimately, this increases the likelihood that programs will be successful. All members of the school community will benefit: students through expanded opportunities to learn and to draw connections between school and the real world, parents and teachers through enhanced communication and trust.

Collaboration for program improvement was the goal of the parent involvement process of this study. An outgrowth of the collaborative process appeared to be that ownership for the program is no longer confined to the teachers but now extends to the parents who were members of the Team and through them to the rest of the school's parents. The parent members of the Team provide the connections to the rest of the school community.

One management paradigm proposes that there are specific principles which must be in place at each of the levels of relationships: trustworthiness at the personal level, trust at the interpersonal, empowerment at the managerial, and alignment at the organizational. Each of these principles depends on the one that precedes it. For example, trust at the interpersonal level cannot exist unless there is trustworthiness on the personal (Covey, 1990, p. 183). This paradigm seems to parallel the study's process of parent involvement.

The parents and teachers on the Team had to be trustworthy and recognize this quality in each other before they could trust. Once trust was established they were personally empowered to collaborate. This empowerment provided the basis for developing the shared vision that was necessary for alignment.

The spirit of this process was expressed in the mission statement that was developed and adopted by the parents and teachers who were members of the Project Improvement Team. It implies that trust, commitment, open communication, and collaboration are keys to effective parent involvement:

> The purpose of the Science Project Improvement Team is to establish a basis of trust and commitment on the parts of parents, students, and teachers to be able to say to each other, 'This is what we need,' and to ensure that those needs will be fulfilled whenever feasible. In other words, the continuous improvement of the program is rooted in a climate of open communication and collaboration.

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APPENDIX A

Cover Letter for Survey

January 6, 1995

Dear Middle School Parents:

The purpose of this letter is to invite you to share your opinions regarding science education in our school.

Our (name of school) Middle School science program was implemented in September, 1992. In the past two years it has been revised and updated annually to incorporate new content and additional teaching strategies. From the onset, a Panel of Experts has provided parental input. The Panel is composed of (town) parents whose careers span many science disciplines.

As we continue our improvement efforts, we ask that you share your perceptions of our science program with us. Your input will guide our ongoing efforts to develop meaningful and stimulating science experiences for our students in order to enhance their learning and to encourage them to develop positive attitudes about science.

Please complete the questionnaire that is inside. Then, fold it as indicated on the back of the questionnaire, and either staple or tape it. Return it to the school in your child's Friday folder. Individual responses will be kept in strictest confidence. Please feel free either to identify yourself by providing your name at the bottom of the questionnaire or to remain anonymous.

A summary of survey results will be published in the (school newsletter) and will be shared with a larger audience through my doctoral research at Teachers College, Columbia University.

I anticipate that survey results will indicate a need to clarify the meaning of the survey data. Parent volunteers will be asked to participate in focus groups which will be scheduled at mutually convenient times and will not exceed sixty minutes in length. If you will be willing to participate in these focus groups, please indicate this on the questionnaire, or send a separate note to this effect.

Very truly yours,

Virginia C. King

APPENDIX B

Parent Science Curriculum Survey

Please indicate your agreement or disagreement with each of the following statements. If you can add details about your child's experiences with science education for grades 6-8 at our school in the 1992-93, 1993-94, or the present school year, please comment in the space provided at the end of this questionnaire.

Statement	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
1. The science program includes ample sources of information (such as reading handouts, on-line, and other computer resources).					
2. The science program provides ample laboratory / hands-on experiences.					
3. The projects in the science program are major factors in my child's understanding of science.					
4. The science program includes adequate review materials to prepare my child for tests.					
5. The science program provides opportunities for my child to draw connections between science in school and science in the real world.					
6. My child has a positive attitude about science.					
7. The science program is exemplary.					
8. Parent participation in curriculum improvement projects (such as this one) is appropriate.					

BEST COPY AVAILABLE

9. Which of the following do you believe are important to an exemplary middle school science program? Check all that apply.

____ information sources
____ laboratory or hands-on experiences
____ projects
____ review materials
____ interdisciplinary connections
____ parent involvement
____ computer technology
____ emphasis on content (facts / information of course)
____ emphasis on skill development (applications of content)
____ lectures
____ developing positive attitudes about science
____ other (Please specify in Comments section below.)

10. Are you willing to participate in a focus group as described in the attached cover letter?

Please circle one of the following: YES NO

11. If you believe that the science program needs more or less of anything, please list below.

Needs	Reasons I Feel This Is Needed

The following questions are for the purpose of determining if the respondents to this questionnaire represent a cross-section of Newtown Middle School parents.

12. Which elementary school did your child attend in grade five?

____ Hawley
____ St. Rose
____ Head o' Meadow
____ school not located in Newtown / Sandy Hook
____ Middle Gate
____ Sandy Hook

BEST COPY AVAILABLE

13. What was your child's most recent grade in science?

___ A-, A, or A+ ___ B+, B, or B- ___ C+, C, or C- ___ D or F

14. What is your child's present grade level?

___ 6 ___ 7 ___ 8

15. Please indicate your child's sex.

___ male ___ female

16. Please indicate changes in your child's attitude about science since he / she entered the Middle School?

___ improved ___ stayed the same ___ worsened

COMMENTS

____

____

____

Print Name (Optional) ______________________ Signature (Optional) ______________________

APPENDIX C

Teacher Science Curriculum Survey

Please indicate your agreement or disagreement with each of the following statements. If you can add details about your students' experiences with science education for grades 6-8 at our school in the 1992-93, 1993-94, or the present school year, please comment in the space provided at the end of this questionnaire.

Statement	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
1. The science program includes ample sources of information (such as reading handouts, on-line, and other computer resources).					
2. The science program provides ample laboratory / hands-on experiences.					
3. The projects in the science program are major factors in my students' understanding of science.					
4. The science program includes adequate review materials to prepare my students for tests.					
5. The science program provides opportunities for my students to draw connections between science in school and science in the real world.					
6. My students have positive attitudes about science.					
7. The science program is exemplary.					
8. Parent participation in curriculum improvement projects (such as this one) is appropriate.					

BEST COPY AVAILABLE

9. Which of the following do you believe are important to an exemplary middle school science program? Check all that apply.

____ information sources
____ laboratory or hands-on experiences
____ projects
____ review materials
____ interdisciplinary connections
____ parent involvement
____ computer technology
____ emphasis on content (facts / information of course)
____ emphasis on skill development (applications of content)
____ lectures
____ developing positive attitudes about science
____ other (Please specify in Comments section below.)

10. If you believe that the science program needs more or less of anything, please list below.

Needs	Reasons I Feel This Is Needed

COMMENTS

____

____

____

____

APPENDIX D

Responses to Pilot of Parent Questionnaire

Statement	Agree	No Opinion	Disagree
1. The science program includes ample sources of information (such as reading handouts, on-line, and other computer resources).	6	0	2
2. The science program provides ample laboratory/hands-on experiences.	8	0	0
3. The projects in the science program are major factors in my child's understanding of science.	6	0	2
4. The science program includes adequate review materials to prepare my child for tests.	6	1	1
5. The science program provides opportunities for my child to draw connections between science in school and science in the real world.	8	0	0
6. My child has a positive attitude about science.	8	0	0
7. The science program is exemplary.	5	3	0
8. Parent participation in curriculum improvement projects (such as this one) is appropriate.	8	0	0

APPENDIX E

Informed Consent Letter and Form for Interviewees

Dear_______________:

Thank you for participating in our recent survey regarding parental perceptions of our Middle School Science Program. Results will be published in the next edition of the (school newsletter).

This letter is a follow-up to that survey and also to our recent telephone conversation in which you agreed to participate in a focus group (or interview). You will recall that I explained that I am a doctoral student at Teachers College, Columbia University. The work that we are doing on our science program is an integral part of my dissertation research.

To facilitate my research, I will be audiotaping our session. After I organize the data, I will share it with you and will speak with you regarding its interpretation. This will be an exciting and interesting part of my research process.

Confidentiality will be maintained regarding your contributions to my research. Neither your name nor the name of our school will be published in any reports of the findings of my study.

When you come to the focus group (or interview), I will be asking you to sign an informed consent form that confirms the content of this letter.

I look forward to seeing you on __________ at ____o'clock in our Faculty Workroom.

Very truly yours,

....

I give consent for Virginia King to share the ideas I have expressed in our recent interview with those who read her study.

I am aware that all of the perceptions I have shared with her will be kept strictly confidential and that neither my name nor that of the school will be published.

Participant:____
Researcher:____
Date:____

APPENDIX F

Focus Group Questions

1. Our teachers have been working to develop a science program that encourages our students to be actively engaged in their learning. They have followed NSTA and AAAS guidelines for planning the content and activities of the program and have struggled with the fact that no textbook is currently available that aligns with the program. Survey data indicates that both parents and teachers agree that additional reading resources and review materials are needed and that lectures are not desirable. What suggestions do you have in these regards?

2. Many parents agree that science projects are important aspects of the program, but some disagree. What suggestions can you add to clarify the issue of projects?

3. Parents have indicated that they believe there is inconsistency and inequity in science opportunities for students between the clusters at each grade level. What specifics can you add to clarify this perception? What suggestions do you have for improving this situation?

4. More parents of girls believe that the science program contains ample hands-on and laboratory experiences. More parents of girls also believe that parents should be involved in curriculum improvement efforts such as this one. Conversely, more parents of boys stated that their sons had positive attitudes about science. What insights can you contribute to explain these differences?

5. Parents have participated in the development of the science program by being members of our Panel of Experts, by participating in the survey and these focus groups. You also are aware of the important roles that parents have played in our school's Governance Council. What other ways can parents be involved in the process of improving our science program? Are you interested in working on a project improvement team with science teachers?

APPENDIX G

Focus Group Agenda, Ground Rules, Logistics

Agenda

Welcome and Introductions
    Self, Teacher, Participants
    Availability of Food and Beverages
Purpose of Focus Group: To add depth and richness to the survey data
School Project/Educational Research
    Overview of Research Questions
    Session will be recorded.
    Informed consent forms are requirement of doctoral program.
Discussion/Data Recorded on Flip Charts and Audiotape
Summation/Thanks

Focus Group Ground Rules

Avoid mentioning specific students and teachers.
All suggestions will be accepted and recorded before they are discussed.
Discussion of suggestions will take place as time permits.

Focus Group Logistics

DATES: February 22 - 8 AM, 4 PM, 6 PM, 8 PM
    February 23 - 1 PM
    February 28 - 8 AM
(as close together as possible to ensure that responses in each group will be impacted as little as possible by Newtown's vast parent networking systems--variety of times offered to accommodate parent schedules)

One teacher will attend all focus groups to help with recording of data on flip chart sheets.

APPENDIX H

Follow-Up Letters to Focus Group Participants

March 20, 1995

Mr./Mrs./Ms. Name
Street
Town, CT Zip Code

Dear First Name:

Thank you for participating in our science focus groups and also for volunteering to work on our Project Improvement Team.

We have selected a group that represents cross-sections of both parents and students. These include the following parents:
(list of eight parent members of Team)

The teachers who will work on the team include:
(list of four teacher members of Team)

We will meet on alternating Thursday mornings from 8:00 to 9:00 A. M. for six weeks in our faculty workroom. Our meeting dates are March 30, April 13, April 27, May 11, May 25, and June 8. Beverages will be provided.

The parent and teacher surveys and parent focus groups have produced a wealth of information about parent and teacher perceptions of our science program. This data will provide the basis for our work.

I look forward to seeing you on March 30.

Sincerely,

Virginia C. King

March 20, 1995

Mr./Mrs./Ms. Name
Street
Town, CT Zip Code

Dear First Name:

Thank you for participating in our science focus groups and also for volunteering to serve on our Project Improvement Team.

An overwhelming number of parents indicated willingness to participate on the team. We have selected a group that represents cross-sections of both parents and students. These include the following parents:
(list of eight parent members of Team)

The teachers who will work on the team include:
(list of four teacher members of Team)

The parent and teacher surveys and parent focus groups have produced a wealth of information about parent and teacher perceptions of our science program. This data will provide the basis for the work of the Project Improvement Team.

We will inform you of our progress in future issues of "The Lion's Roar."

Sincerely,

Virginia C. King

March 20, 1995

Mr./Mrs./Ms. Name
Street
Town, CT Zip Code

Dear First Name:

Thank you for participating in our science focus groups.

An overwhelming number of parents indicated willingness to participate on the team. We have selected a group that represents cross-sections of both parents and students. These include the following parents:
(list of eight parent members of Team)

The teachers who will work on the team include:
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The parent and teacher surveys and parent focus groups have produced a wealth of information about parent and teacher perceptions of our science program. This data will provide the basis for the work of the Project Improvement Team.

We will inform you of our progress in future issues of "The Lion's Roar."

Sincerely,

Virginia C. King

APPENDIX I

Interview Questions for Parent Members of Project Improvement Team

Behavior

Prior to working with our Project Improvement Team, in what ways have you been involved in schools?

What previous involvement have you had with this school?

If I had been shadowing you during the time we have been working together on the Project Improvement Team, what would I have seen that relates to our work but did not take place during our sessions?

Probes:
- telephone conversations with other parents
- other input from other parents
- conversations with your spouse
- conversations with educators who were not on the team
- other

Did you initiate these conversations?_______

Opinion/Value

What do you believe has been or will be your most important contribution to the development of the science program at our school?

If we were to apply a similar process to another project, how might it be improved?

What were the strengths and challenges of the parent involvement process?

Strengths	Challenges

Feeling

What three adjectives would describe how you feel about your involvement in the development of the science program? (Probes: involved? happy? productive? valued?)

Did you feel this way when you began your work on the team?

Knowledge

Do you know of other schools that have involved parents in the development of school programs?
If so, in what ways?

How would you characterize the process that was used for involving parents in our science program in relation to other collaborative efforts in our schools? (Probe: participants' commitment? satisfaction? contributions?)

In what ways was our Project Improvement Team successful and unsuccessful in addressing the issues that were raised in the surveys and focus groups?

What are your hopes for our science program as the result of the parent involvement process (surveys, focus groups, Project Improvement Team)?

Demographics/Background

Number of Children:_______
Ages:_______ Sexes:_______ Grade Levels:_______
Most Recent Grades in Science:_______

What were your experiences with science education when you were in the middle school grades?

What are your academic or career aspirations for your children?

Summation/Reflections/Additional Input

What else would you like to add about the process for involving parents in our science program, its implications for improving our science program, its significance for the future, etc.?

APPENDIX J

Interview Questions for Teacher Members of the Project Improvement Team

Behavior

Prior to working with our project improvement team, in what ways other than teaching have you been involved in schools?

What previous involvement have you had with this school?

If I had been shadowing you during the time we have been working together on the Project Improvement Team, what would I have seen that relates to our work but did not take place during our sessions?

Probes:
- telephone conversations with other teachers or parents
- other input from other teachers or parents
- conversations with your spouse
- conversations with educators who were not on the team
- other

Did you initiate these conversations?_______

Opinion/Value

What do you believe has been or will be your most important contribution to the development of the science program at our school?

If we were to apply a similar process to another project, how might it be improved?

What were the strengths and challenges of the parent involvement process?

Strengths	Challenges

Feeling

What three adjectives would describe how you feel about your involvement in the development of the science program? (Probes: involved? happy? productive? valued?)

Did you feel this way when you began your work on the team?

Knowledge

Do you know of other schools that have involved parents in the development of school programs?
If so, in what ways?

How would you characterize the process that was used for involving parents in our science program in relation to other collaborative efforts in our schools? (Probe: participants' commitment? satisfaction? contributions?)

In what ways was our Project Improvement Team successful and unsuccessful in addressing the issues that were raised in the surveys and focus groups?

What are your hopes for our science program as the result of the parent involvement process (surveys, focus groups, Project Improvement Team)?

What were your experiences with science education when you were in the middle school grades?

Summation/Reflections/Additional Input

What else would you like to add about the process for involving parents in our science program, its implications for improving our science program, its significance for the future, etc.?

APPENDIX K - Table 1

Parent Agreement or Disagreement with Statements about the Science Program - Percents[1]

Statement	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
1. The science program includes ample sources of information (such as reading handouts, on-line, and other computer resources).	8	51	11	20	4
2. The science program provides ample laboratory/ hands-on experiences.	21	47	11	15	2
3. The projects in the science program are major factors in my child's understanding of science.	16	48	15	15	1
4. The science program includes adequate review materials to prepare my child for tests.	15	48	16	16	1
5. The science program provides opportunities for my child to draw connections between science in school and science in the real world.	12	54	16	12	1
6. My child has a positive attitude about science.	37	44	7	9	1
7. The science program is exemplary.	6	34	26	22	4
8. Parent participation in curriculum improvement projects (such as this one) is appropriate.	25	48	16	6	1

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[1] Percents are rounded to the nearest whole number. They were calculated by dividing raw scores by 300, the total number of respondents. A corresponding table of raw scores may be found in Appendix L.

APPENDIX K - Table 2

Parent Beliefs Regarding Components of An Exemplary Science Program - Percents[2]

Component	Percent of Parents Agreeing with Statement
Information Sources	78
Laboratory or Hands-On Experiences	95
Projects	66
Review Materials	65
Interdisciplinary Connections	51
Parent Involvement	33
Computer Technology	71
Emphasis on Content	65
Emphasis on Skill Development	72
Lectures	24
Developing Positive Attitudes	81

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[2] Percents are rounded to the nearest whole number and were calculated by dividing raw scores by 300, the total number of respondents. A corresponding table of raw scores may be found in Appendix L.

APPENDIX K - Table 3

Demographic Data of Parents and Their Children - Percents[3]

A. Elementary School Attended in Grade 5

School Attended in Grade 5	Percent of Students
District School 1	18
District School 2	22
District School 3	24
District School 4	24
Parochial School in Town	1
Elementary School Not in Town	10
School Not Reported	1

B. Child's Most Recent Grade in Science

Grade	A+, A, A-	B+, B, B-	C+, C, C-	D or F	Grade Not Given
Percent of Students	55	31	8	1	4

C. Child's Present Grade Level

Grade Level	Six	Seven	Eight	Not Given
Percent of Students	37	33	32	1

D. Child's Sex

Sex of Child	Female	Male	Not Given
Percent of Respondents	52	47	1

E. Child's Attitude about Science

Child's Attitude	Improved	Stayed the Same	Worsened	Not Given
Percent of Students	49	41	9	0

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[3] Percents are rounded to the nearest whole number and were calculated by dividing raw scores by 300, the total number of respondents. A corresponding table of raw scores may be found in Appendix L.

APPENDIX K

Comparison of Responses of Parents of Male and Female Students - Percents[4]

Statement	SA		A		NO		D		SD	
	M	F	M	F	M	F	M	F	M	F
1. The science program includes ample sources of information (such as reading handouts, on-line, and other computer resources).	8	9	54	49	13	10	17	23	4	5
2. The science program provides ample laboratory/ hands-on experiences.	20	22	44	51	15	8	16	14	1	3
3. The projects in the science program are major factors in my child's understanding of science.	15	17	52	46	11	19	18	14	1	1
4. The science program includes adequate review materials to prepare my child for tests.	15	15	47	51	20	12	16	17	1	1
5. The science program provides opportunities for my child to draw connections between science in school and science in the real world.	14	11	49	59	17	15	14	11	1	1
6. My child has a positive attitude about science.	44	31	41	47	4	10	9	10	0	1
7. The science program is exemplary.	7	5	33	35	23	29	24	21	3	5
8. Parent participation in curriculum improvement projects (such as this one) is appropriate.	26	25	43	53	18	14	7	5	1	1

---

[4] Strongly Agree - SA, Agree - A, No Opinion - NO, Disagree - D, Strongly Disagree - SD

Percents are rounded to the nearest whole number and were calculated by dividing raw scores by the total number of respondents, 142 for males and 156 for females. A corresponding table of raw scores may be found in Appendix L.

APPENDIX K - Table 5

Comparison of Beliefs of Parents of Male and Female Students Importance of Components of An Exemplary Science Program - Percents[5]

Component	Parents of Males	Parents of Females
Information Sources	77	81
Laboratory or Hands-On Experiences	96	96
Projects	68	64
Review Materials	66	66
Interdisciplinary Connections	51	53
Parent Involvement	35	31
Computer Technology	73	71
Emphasis on Content	67	64
Emphasis on Skill Development	72	73
Lectures	28	22
Developing Positive Attitudes about Science	78	85

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[5] Percents are rounded to the nearest whole number and were calculated by dividing raw scores by the total number of respondents, 142 for males and 156 for females. A corresponding table of raw scores may be found in Appendix L.

APPENDIX K - Table 6

Comparison of Responses of Parents of Students in Grades 6, 7, and 8 - Percents[6]

Statement	Strongly Agree			Agree			No Opinion			Disagree			Strongly Disagree		
	6	7	8	6	7	8	6	7	8	6	7	8	6	7	8
1. The science program includes ample sources of information (such as reading handouts, on-line, and other computer resources).	8	9	9	55	45	61	11	17	8	19	26	20	7	2	3
2. The science program provides ample laboratory / hands-on experiences.	19	14	32	46	49	53	14	17	3	18	19	11	3	1	2
3. The projects in the science program are major factors in my child's understanding of science.	22	12	15	47	59	46	14	16	17	15	13	20	2	0	2
4. The science program includes adequate review materials to prepare my child for tests.	19	11	15	47	51	54	16	21	13	18	15	18	0	2	1
5. The science program provides opportunities for my child to draw connections between science in school and science in the real world.	14	7	17	54	66	51	18	16	15	13	11	15	1	0	2
6. My child has a positive attitude about science.	45	30	37	42	54	40	6	9	6	7	7	14	0	0	2
7. The science program is exemplary.	5	5	10	36	35	39	33	30	20	19	27	27	7	2	3
8. Parent participation in curriculum improvement projects (such as this one) is appropriate.	32	22	24	47	52	52	17	20	13	4	4	11	0	2	1

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[6] Percents are rounded to the nearest whole number and were calculated by dividing raw scores by the total number of parents who responded to each question. For grade 6, responses to the eight questions ranged from 105 to 109; for grade 7, from 82 to 87; for grade eight, from 89 to 100. A corresponding table of raw scores may be found in Appendix L.

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APPENDIX K - Table 7

Comparison of Responses of Parents Whose Children Attended Different Schools in Fifth Grade - Percents[7]

Statement Note: In order to present data in one concise table, data for Strongly Agree and Agree is reported as Agree (A); Disagree and Strongly Disagree as Disagree (D). No opinion answers are not reported.	District School A		District School B		District School C		District School D		Parochial School		Out-of-District	
	A	D	A	D	A	D	A	D	A	D	A	D
1. The science program includes ample sources of information (such as reading handouts, on-line, and other computer resources).	68	26	52	34	58	25	75	16	50	50	58	27
2. The science program provides ample laboratory / hands-on experiences.	69	23	54	29	70	17	82	8	100	0	82	11
3. The projects in the science program are major factors in my child's understanding of science.	69	18	64	25	65	12	78	11	50	50	50	25
4. The science program includes adequate review materials to prepare my child for tests.	70	17	61	22	59	17	79	11	50	50	48	26
5. The science program provides opportunities for my child to draw connections between science in school and science in the real world.	70	17	68	22	68	12	70	8	100	0	68	14
6. My child has a positive attitude about science.	78	11	89	6	81	9	85	10	100	0	75	21
7. The science program is exemplary.	41	37	35	38	45	21	55	19	75	0	27	35
8. Parent participation in curriculum improvement projects (such as this one) is appropriate.	72	11	81	6	75	4	79	4	50	25	81	8

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[7] Percents are rounded to the nearest whole number and were calculated by dividing raw scores by the total number of parents who responded to each question. For school A, responses ranged from 51 to 54; for school B, from 60 to 64; for school C, from 62 to 69; for school D, from 69 to 72; for school E, all 4 respondents answered all 8 questions; for school F, 26 to 28. Percents of "no opinion" responses are not included in this table. A corresponding table of raw scores may be found in Appendix L.

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APPENDIX K - Table 8

Comparison of Responses of Parents of Students Exhibiting Different Attitudes - Percents[8]

Statement Note: In order to present data in one concise table, data for Strongly Agree and Agree is reported as Agree (A); Disagree and Strongly Disagree as Disagree (D). No opinion answers are not reported.	Improved Attitude		No Change		Worsened Attitude	
	A	D	A	D	A	D
1. The science program includes ample sources of information (such as reading handouts, on-line, and other computer resources).	74	19	56	27	38	46
2. The science program provides ample laboratory/hands-on experiences.	82	13	63	17	58	35
3. The projects in the science program are major factors in my child's understanding of science.	82	12	55	20	44	32
4. The science program includes adequate review materials to prepare my child for tests.	77	12	58	22	50	27
5. The science program provides opportunities for my child to draw connections between science in school and science in the real world.	80	9	64	16	44	24
6. My child has a positive attitude about science.	95	2	78	9	38	54
7. The science program is exemplary.	67	17	25	31	8	62
8. Parent participation in curriculum improvement projects (such as this one) is appropriate.	85	6	67	8	69	8

---

[8] Agree - A, Disagree - D

Percents are rounded to the nearest whole number and were calculated by dividing raw scores by the total number of parents who responded to each question. For improving attitudes, responses ranged from 132 to 140; for no change, from 115 to 119; for worsened attitude, from 25 to 26. Percents of "no opinion" responses are not included in this table. A corresponding table of raw scores may be found in Appendix L.

APPENDIX K - Table 9

Comparison of Responses of Parents of Children of Differing Achievement Levels - Percents[9]

Statement Note: In order to present data in one concise table, data for Strongly Agree and Agree is reported as Agree (A); Disagree and Strongly Disagree as Disagree (D). No opinion answers are not reported.	Grade of A		Grade of B		Grade of C		Grade of D or F	
	Agree	Disagree	Agree	Disagree	Agree	Disagree	Agree	Disagree
1. The science program includes ample sources of information (such as reading handouts, on-line, and other computer resources).	63	28	68	24	45	18	67	33
2. The science program provides ample laboratory / hands-on experiences.	70	17	75	19	65	17	60	60
3. The projects in the science program are major factors in my child's understanding of science.	64	18	70	16	78	13	50	50
4. The science program includes adequate review materials to prepare my child for tests.	68	18	67	15	52	26	50	25
5. The science program provides opportunities for my child to draw connections between science in school and science in the real world.	70	14	63	13	62	10	50	25
6. My child has a positive attitude about science.	85	7	86	11	71	13	25	75
7. The science program is exemplary.	42	31	49	20	33	24	33	67
8. Parent participation in curriculum improvement projects (such as this one) is appropriate.	74	10	85	3	59	5	100	0

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[9] Percents are rounded to the nearest whole number and were calculated by dividing raw scores by the total number of parents who responded to each question. For students who had achieved A grades in the previous marking period, responses ranged from 153 to 163; for B students, from 88 to 91; for C students, from 21 to 23, for D or F students, from 3 to 4. Percents of "no opinion" responses are not reported in this table. A corresponding table of raw scores may be found in Appendix L.

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APPENDIX K - Table 10

Teacher Agreement or Disagreement with Statements about the Science Program - Percents[10]

Statement	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
1. The science program includes ample sources of information (such as reading handouts, on-line, and other computer resources).	30	50	0	10	10
2. The science program provides ample laboratory/ hands-on experiences.	40	50	0	0	0
3. The projects in the science program are major factors in my child's understanding of science.	60	20	0	10	0
4. The science program includes adequate review materials to prepare my child for tests.	10	50	0	10	10
5. The science program provides opportunities for my child to draw connections between science in school and science in the real world.	30	40	0	10	10
6. My child has a positive attitude about science.	30	60	0	0	0
7. The science program is exemplary.	20	20	30	0	0
8. Parent participation in curriculum improvement projects (such as this one) is appropriate.	20	40	0	30	0

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[10] Percents are rounded to the nearest whole number. They were calculated by dividing raw scores the total number of respondents, 10 teachers. A corresponding table of raw scores may be found in Appendix L.

APPENDIX K - Table 11

Teacher Beliefs Regarding Components of An Exemplary Science Program - Percents[11]

Component	Percent of Teachers Agreeing with Statement
Information Sources	80
Laboratory or Hands-On Experiences	80
Projects	70
Review Materials	50
Interdisciplinary Connections	70
Parent Involvement	20
Computer Technology	80
Emphasis on Content	30
Emphasis on Skill Development	60
Lectures	0
Developing Positive Attitudes	70

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[11] Percents are rounded to the nearest whole number. They were calculated by dividing raw scores by the total number of respondents, 10 teachers. A corresponding table of raw scores may be found in Appendix L.

APPENDIX K - Table 12

Comparison of Teacher and Parent Perspectives of Science Program - Percents[12]

Statement	SA		A		NO		D		SD	
	T	P	T	P	T	P	T	P	T	P
1. The science program includes ample sources of information (such as reading handouts, on-line, and other computer resources).	30	8	50	51	0	11	10	20	10	4
2. The science program provides ample laboratory/ hands-on experiences.	40	21	50	47	0	11	0	15	0	2
3. The projects in the science program are major factors in my child's understanding of science.	60	16	20	48	0	15	10	15	0	1
4. The science program includes adequate review materials to prepare my child for tests.	10	15	50	48	0	16	10	16	10	1
5. The science program provides opportunities for my child to draw connections between science in school and science in the real world.	30	12	40	54	0	16	10	12	0	1
6. My child has a positive attitude about science.	30	37	60	44	0	7	0	9	0	1
7. The science program is exemplary.	20	6	20	34	30	26	0	22	0	4
8. Parent participation in curriculum improvement projects (such as this one) is appropriate.	20	25	40	48	0	16	30	6	0	1

---

[12] Strongly Agree - SA, Agree - A, No Opinion - NO, Disagree - D, Strongly Disagree - SD; Teacher - T, Parent - P

Percents are rounded to the nearest whole number and were calculated by dividing raw scores by the total number of respondents in each category, 300 parents, 10 teachers. A corresponding table of raw scores may be found in Appendix L.

APPENDIX K - Table 13

Comparison of Beliefs of Teachers and Parents Importance of Components of An Exemplary Science Program[13]

Component	Teachers	Parents
Information Sources	80	78
Laboratory or Hands-On Experiences	80	95
Projects	70	66
Review Materials	50	65
Interdisciplinary Connections	70	51
Parent Involvement	20	33
Computer Technology	80	71
Emphasis on Content	30	65
Emphasis on Skill Development	60	72
Lectures	0	24
Developing Positive Attitudes about Science	70	81

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[13] Percents are rounded to the nearest whole number and were calculated by dividing raw scores by the total number of respondents in each category, 300 parents, 10 teachers. A corresponding table of raw scores may be found in Appendix L.

APPENDIX L - Table 1

Parent Agreement or Disagreement with Statements about the Science Program - Raw Data[14]

Statement	SA	A	NO	D	SD
1. The science program includes ample sources of information (such as reading handouts, on-line, and other computer resources).	25	154	34	60	13
2. The science program provides ample laboratory/hands-on experiences.	63	142	33	45	6
3. The projects in the science program are major factors in my child's understanding of science.	48	145	45	46	4
4. The science program includes adequate review materials to prepare my child for tests.	44	145	47	49	3
5. The science program provides opportunities for my child to draw connections between science in school and science in the real world.	37	162	47	37	3
6. My child has a positive attitude about science.	110	131	21	27	2
7. The science program is exemplary.	18	102	78	66	12
8. Parent participation in curriculum improvement projects (such as this one) is appropriate.	76	143	47	17	3

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[14] Strongly Agree - SA, Agree - A, No Opinion - NO, Disagree - D, Strongly Disagree - SD

APPENDIX L - Table 2

Parent Beliefs Regarding Components of An Exemplary Science Program - Raw Data

Component	Number of Parents Agreeing with Statement
Information Sources	235
Laboratory or Hands-On Experiences	286
Projects	197
Review Materials	196
Interdisciplinary Connections	154
Parent Involvement	98
Computer Technology	214
Emphasis on Content	194
Emphasis on Skill Development	216
Lectures	73
Developing Positive Attitudes	242

APPENDIX L - Table 3

Demographic Data of Parents and Their Children - Raw Data

A. Elementary School Attended in Grade 5

School Attended in Grade 5	Number of Students
District School 1	55
District School 2	65
District School 3	71
District School 4	73
Parochial School Located in Town	4
Elementary School Not Located in Town	29
School Not Reported	3

B. Child's Most Recent Grade in Science

Grade	A+, A, A-	B+, B, B-	C+, C, C-	D or F	Grade Not Given
Number of Students	165	93	25	4	13

C. Child's Present Grade Level

Grade Level	Six	Seven	Eight	Not Given
Number of Students	113	89	95	3

D. Child's Sex

Sex of Child	Female	Male	Not Given
Number of Respondents	156	142	3

E. Child's Attitude about Science

Child's Attitude	Improved	Stayed the Same	Worsened	Not Given
Percent of Students	49	41	9	2

APPENDIX L - Table 4

Comparison of Responses of Parents of Male and Female Students - Raw Data[15]

Statement	SA		A		NO		D		SD	
	M	F	M	F	M	F	M	F	M	F
1. The science program includes ample sources of information (such as reading handouts, on-line, and other computer resources).	11	14	77	77	18	16	24	36	5	8
2. The science program provides ample laboratory/ hands-on experiences.	29	34	62	80	21	12	23	22	2	4
3. The projects in the science program are major factors in my child's understanding of science.	21	27	74	71	15	30	25	21	2	2
4. The science program includes adequate review materials to prepare my child for tests.	21	23	66	79	28	19	22	27	1	2
5. The science program provides opportunities for my child to draw connections between science in school and science in the real world.	20	17	70	92	24	23	20	17	2	1
6. My child has a positive attitude about science.	62	48	58	73	6	15	12	15	0	2
7. The science program is exemplary.	10	8	47	55	33	45	34	32	4	8
8. Parent participation in curriculum improvement projects (such as this one) is appropriate.	37	39	61	82	26	21	10	7	2	1

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[15] Strongly Agree - SA, Agree - A, No Opinion - NO, Disagree - D, Strongly Disagree - SD

APPENDIX L - Table 5

Comparison of Beliefs of Parents of Male and Female Students Importance of Components of An Exemplary Science Program - Raw Data

Component	Parents of Males	Parents of Females
Information Sources	109	126
Laboratory or Hands-On Experiences	136	150
Projects	97	100
Review Materials	93	103
Interdisciplinary Connections	72	82
Parent Involvement	49	49
Computer Technology	104	110
Emphasis on Content	95	99
Emphasis on Skill Development	102	114
Lectures	39	34
Developing Positive Attitudes about Science	110	132

APPENDIX L - Table 6

Comparison of Responses of Parents of Students in Grades 6, 7, and 8 - Raw Data

Statement	Strongly Agree			Agree			No Opinion			Disagree			Strongly Disagree		
	6	7	8	6	7	8	6	7	8	6	7	8	6	7	8
1. The science program includes ample sources of information (such as reading handouts, on-line, and other computer resources).	9	8	8	59	39	56	12	15	7	20	22	18	8	2	3
2. The science program provides ample laboratory / hands-on experiences.	21	12	30	50	42	50	15	15	3	19	16	10	3	1	2
3. The projects in the science program are major factors in my child's understanding of science.	24	10	14	50	51	44	15	14	16	16	11	19	2	0	2
4. The science program includes adequate review materials to prepare my child for tests.	21	9	14	51	43	51	17	18	12	19	13	17	0	2	1
5. The science program provides opportunities for my child to draw connections between science in school and science in the real world.	15	6	16	59	55	48	20	13	14	14	9	14	1	0	2
6. My child has a positive attitude about science.	49	26	35	46	47	38	7	8	6	8	6	13	0	0	2
7. The science program is exemplary.	5	4	9	38	29	35	35	25	18	20	22	24	7	2	3
8. Parent participation in curriculum improvement projects (such as this one) is appropriate.	35	19	22	51	44	48	18	17	12	4	3	10	0	2	1

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APPENDIX L - Table 7

Comparison of Responses of Parents Whose Children Attended Different Schools in Fifth Grade - Raw Data

Statement	District School A		District School B		District School C		District School D		Parochial School		Out-of-District	
	A	D	A	D	A	D	A	D	A	D	A	D
1. The science program includes ample sources of information (such as reading handouts, on-line, and other computer resources).	36	14	33	22	40	17	52	11	2	2	15	7
2. The science program provides ample laboratory / hands-on experiences.	36	12	34	18	48	12	59	6	4	0	23	3
3. The projects in the science program are major factors in my child's understanding of science.	35	9	40	16	45	8	56	8	2	2	14	7
4. The science program includes adequate review materials to prepare my child for tests.	37	9	38	14	41	12	57	8	2	2	13	7
5. The science program provides opportunities for my child to draw connections between science in school and science in the real world.	38	9	41	13	46	8	50	6	4	0	19	4
6. My child has a positive attitude about science.	42	6	57	4	55	6	61	7	4	0	21	6
7. The science program is exemplary.	21	19	22	24	28	13	38	13	3	0	7	9
8. Parent participation in curriculum improvement projects (such as this one) is appropriate.	38	6	50	4	51	3	57	3	2	1	21	2

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APPENDIX L - Table 8

Comparison of Responses of Parents of Students Exhibiting Different Attitudes - Raw Data

Statement Note: In order to present data in one concise table, data for Strongly Agree and Agree is reported as Agree (A); Disagree and Strongly Disagree as Disagree (D). No opinion answers are not reported.	Improved Attitude		No Change		Worsened Attitude	
	Agree	Disagree	Agree	Disagree	Agree	Disagree
1. The science program includes ample sources of information (such as reading handouts, on-line, and other computer resources).	103	27	66	32	10	12
2. The science program provides ample laboratory/hands-on experiences.	115	19	75	20	15	9
3. The projects in the science program are major factors in my child's understanding of science.	115	17	66	24	11	8
4. The science program includes adequate review materials to prepare my child for tests.	108	17	68	26	13	7
5. The science program provides opportunities for my child to draw connections between science in school and science in the real world.	114	13	74	18	11	6
6. My child has a positive attitude about science.	136	3	93	11	10	14
7. The science program is exemplary.	89	23	29	36	2	16
8. Parent participation in curriculum improvement projects (such as this one) is appropriate.	121	9	77	9	18	2

APPENDIX L - Table 9

Comparison of Responses of Parents of Children of Differing Achievement Levels - Raw Data

Statement Note: In order to present data in one concise table, data for Strongly Agree and Agree is reported as Agree (A); Disagree and Strongly Disagree as Disagree (D). No opinion answers are not reported	Grade of A		Grade of B		Grade of C		Grade of D or F	
	Agree	Disagree	Agree	Disagree	Agree	Disagree	Agree	Disagree
1. The science program includes ample sources of information (such as reading handouts, on-line, and other computer resources).	102	45	60	21	10	4	2	1
2. The science program provides ample laboratory / hands-on experiences.	113	27	68	17	15	4	2	2
3. The projects in the science program are major factors in my child's understanding of science.	102	29	64	15	18	3	2	2
4. The science program includes adequate review materials to prepare my child for tests.	109	28	61	14	12	6	2	1
5. The science program provides opportunities for my child to draw connections between science in school and science in the real world.	112	23	66	12	13	2	2	1
6. My child has a positive attitude about science.	139	12	78	10	14	3	1	3
7. The science program is exemplary.	65	48	44	18	7	5	1	2
8. Parent participation in curriculum improvement projects (such as this one) is appropriate.	119	16	77	3	13	1	3	0

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APPENDIX L - Table 10

Teacher Agreement or Disagreement with Statements about the Science Program - Raw Data[16]

Statement	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
1. The science program includes ample sources of information (such as reading handouts, on-line, and other computer resources).	3	5	0	1	1
2. The science program provides ample laboratory/hands-on experiences.	4	5	0	0	0
3. The projects in the science program are major factors in my child's understanding of science.	6	2	0	1	0
4. The science program includes adequate review materials to prepare my child for tests.	1	5	0	1	1
5. The science program provides opportunities for my child to draw connections between science in school and science in the real world.	3	4	0	1	1
6. My child has a positive attitude about science.	3	6	0	0	0
7. The science program is exemplary.	2	2	3	0	0
8. Parent participation in curriculum improvement projects (such as this one) is appropriate.	2	4	0	3	0

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[16] Strongly Agree - SA, Agree - A, No Opinion - NO, Disagree - D, Strongly Disagree - SD

APPENDIX L - Table 11

Teacher Beliefs Regarding Components of An Exemplary Science Program - Raw Data

Component	Number of Teachers Agreeing with Statement
Information Sources	8
Laboratory or Hands-On Experiences	8
Projects	7
Review Materials	5
Interdisciplinary Connections	7
Parent Involvement	2
Computer Technology	8
Emphasis on Content	3
Emphasis on Skill Development	6
Lectures	0
Developing Positive Attitudes	7

APPENDIX L - Table 12

Comparison of Teacher and Parent Perspectives of Science Program - Raw Data[17]

Statement	SA		A		NO		D		SD	
	T	P	T	P	T	P	T	P	T	P
1. The science program includes ample sources of information (such as reading handouts, on-line, and other computer resources).	3	25	5	154	0	34	1	60	1	13
2. The science program provides ample laboratory/hands-on experiences.	4	63	5	142	0	33	0	45	0	6
3. The projects in the science program are major factors in my child's understanding of science.	6	48	2	145	0	45	1	46	0	4
4. The science program includes adequate review materials to prepare my child for tests.	1	44	5	145	0	47	1	49	1	3
5. The science program provides opportunities for my child to draw connections between science in school and science in the real world.	3	37	4	162	0	47	1	37	0	3
6. My child has a positive attitude about science.	3	110	6	131	0	21	0	27	0	2
7. The science program is exemplary.	2	18	2	102	3	78	0	66	0	12
8. Parent participation in curriculum improvement projects (such as this one) is appropriate.	2	76	4	143	0	47	3	17	0	3

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[17] Strongly Agree - SA, Agree - A, No Opinion - NO, Disagree - D, Strongly Disagree - SD

APPENDIX L - Table 13

Comparison of Beliefs of Teachers and Parents
Importance of Components of An Exemplary Science Program - Raw Data

Component	Teachers	Parents
Information Sources	8	235
Laboratory or Hands-On Experiences	8	286
Projects	7	197
Review Materials	5	196
Interdisciplinary Connections	7	154
Parent Involvement	2	98
Computer Technology	8	214
Emphasis on Content	3	194
Emphasis on Skill Development	6	216
Lectures	0	73
Developing Positive Attitudes about Science	7	242

APPENDIX M

Consensus Statements of Project Improvement Team Meetings
First Meeting - March 30, 1995

1. Communication between parents and teachers is important. Parents need information about the history of our science program, the results of the parent surveys and focus groups, progress reports about the work of the Project Improvement Team, as well as ongoing information about teaching units and expectations via the Friday folders.

2. Parents should be involved in program development (expressing their perceptions, working with teachers to analyze data, establishing priorities, etc.). However, both the teachers and parents on the Project Improvement Team believe that parents should not be involved in curriculum writing.

3. The Project Improvement Team will begin its work by analyzing the data from the surveys and focus groups (including the data tables and transcripts that were in your packets as well as the big charts that contain the needs/reasons and concerns from the parent questionnaires already sorted into demographic and topic categories).

Consensus Statements - Second Meeting of PIT - April 13, 1995

1. According to the survey and focus group data, the major issues raised by parents and teachers are:
    - consistency / organization / resources
    - textbook issue, rubrics (especially for projects), technology, handouts)
    - communication (between parents and teachers) / parent education

2. The members of the Project Improvement Team were not concerned about the minor differences between the demographic groups. After a lengthy discussion, the team members felt that some of these are likely to be the result of differences in cohort groups (e.g., present students in grades 6, 7, and 8) and normal year to year variations. There was agreement that there was not enough data to focus the attention of the PIT on differences in groups but that this information might be used as a basis for longitudinal tracking to determine trends.

3. Improvement suggestions offered by members of the PIT included:
    - Consistency / Organization / Resources
        - materials hole-punched and stapled together
        - summary of unit / content outline
        - suggestions for parents to help children review
        - key words - highlighted? bold? italics?
        - notetaking skills
        - separate 3 ring binder for science?
        - pages in packets pre-numbered
        - enrichment suggestions - bibliography, additional resources
        - connections to previous learning / overall flow of course
        - same packets of handouts for all clusters at each grade level
    - Communication / Parent Education - information for parents
        - history of science program
        - organizational plan
        - textbooks as resources

4. Quantitative Analysis of Comments and Needs / Reasons
Susan took the responses data from the open-ended questions of the survey and grouped the responses. She then constructed graphs which showed the grouped responses arranged in order so that the categories drawing the largest numbers of responses were delineated. The graphs illustrate that the numbers of responses to the two open-ended questions paralleled those of the short-answer questions. Therefore, there was consistency in parent concerns. Furthermore, Susan's display of the open-ended data shows that parents, in general, agree with the goals of the science program in terms of the value of hands-on / laboratory experiences, projects, technology, etc.

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Consensus Statements - Fifth Meeting of PIT - May 25, 1995

Plans for Improving Consistency

The four teachers who are members of the Project Improvement Team (PIT) will share the team's decisions with the other members of the department at the June 13 department meeting. The curriculum writing team will plan for incorporating the changes we have listed either during the summer work week or en route as units are developed during grade level meetings throughout the year.

The concept of a 1" separate binder for science (in lieu of a textbook) will be introduced at the June meeting. If approved, Virginia will present the idea to the study skills committee for inclusion in the list of required supplies. (Note: Coincidentally, the PTA is providing seed money to establish a school store to be open before school in the cafeteria. If approved by both members of the department and the study skills committee, I will communicate the need to stock 1" flexible covered binders for science.

The consistency issues that are "no brainers" such as hole-punching of handouts, stapling of packets, and improved quality of copy will be discussed within the department and implemented in all classes in the fall.

The teachers who are members of the PIT will communicate with Nancy Martin and the other teachers at their grade level regarding the issue of improving notetaking skills.

Karen, Bill, and John will facilitate the development of grade level files of articles and periodicals. Virginia will send copies of our scope and sequence to Bill and John. The science teachers will develop a list of periodicals that would be of value to students and will send these to Bill and John. Karen and Virginia will develop a letter to parents to explain the notion of classroom resources and to invite their participation in the project.

Grade level science meetings will be reestablished to ensure equity and consistency.

Plans for Improving Communication

A "Science Parents' Night" will be held early in the fall. Its first purpose will be to explain the history of the program, this goals, the data that was collected from the survey and focus groups, the work of the PIT. It will also provide a forum for introducing the concept of an ongoing PIT, identifying its members, and suggesting ways that parents, students, and teachers can collaborate to enhance science education at our school. The members of the ongoing PIT will meet in September to plan this meeting and to devise ways to publicize it.

The draft of the handouts for parents that Virginia distributed at the meeting will be completed and distributed at the "Parents' Night." We agreed that the opening paragraph should include a statement of intent--to establish a basis of trust and commitment on the parts of parents, students, and teachers to be able to say to each other, "This is what we need," and to ensure that those needs will be fulfilled whenever feasible. In other words, the continuous improvement of the program is rooted in a climate of open communication and collaboration. A section on parent, student, and teacher responsibilities will be added to the handouts.

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Separate one-page handouts with bulleted highlights of the program will be distributed over several weeks in Friday folders.

Virginia will contact (reporter) at the (local newspaper) to investigate the possibility of a feature article on our program. The handouts will provide a basis for the article.

The names of members of the ongoing PIT will be published in the "Lion's Roar." A trouble-shooting procedure and a related form will be developed for parents to ask questions, seek advice, and voice their concerns about the program.

Tasks we agreed to accomplish to satisfy the concerns regarding our science program:

Improved Consistency

1. same packets for all students in all clusters at each grade level
2. notetaking skills - improve.
3. rubrics (especially for projects) - clear purpose, maximum amount to be spent for materials, roles of parents
4. numbers and kinds of activities and homework assignments
5. connections to real world
6. enrichment - files of articles in each classroom, bibliographies, books for supplemental reading (Karen, Bill, John)
7. assessments
8. required oral presentations on current science topics (formalized)
9. format: pre-numbered pages, syllabus, hole-punched, pages stapled or bound together, improved quality of copy, separate 3 ring binder for science (1", flexible binder), key words in italics or bold

Improved Communication

1. "study guides" for parents
2. deadlines
3. history of science program (Virginia)
4. organizational plan of program
5. textbooks as resources (Virginia)
6. enrichment suggestions
7. deadlines and checklists for students (teachers to check)
8. results of surveys, focus groups, PIT work (Virginia)
9. explanations to parents regarding what help is important
10. Raise awareness among parents, teachers, students about peer pressure (gender, ability groups).
11. Communication to parents to share articles/periodicals that are relevant
12. Suggested communication vehicles:
    "Lion's Roar meetings with parents letters to parents
    signing tests Friday folders
    tear off sheets for parent responses (with deadlines for responses
    ongoing Project Improvement Team with meetings 3 or 4 times per year
    (names of members in "Lion's Roar" as resources)

APPENDIX N

Affinity Diagram for a Quality Science Program
(as Perceived by Members of the Project Improvement Team)

In my work with the Project Improvement Team I prepared an Affinity Diagram that measured 24" X 36" in size. I was unable to replicate that document in its original form for this dissertation because of the amount of information that it contained. Therefore, I am including the improvement categories and strategies that were agreed upon by the members of the Team.

Improved Resources			
Handouts		Parent Involvement	Other Resources
Content	Organization		
"flow" of course	pre-numbered pages	"wish list" of reading resources - parents to organize and maintain files	after school mentoring
connections to previous learning	syllabus	parents as resources in classes	technology
summary of unit	hole-punched	one notebook PC per student	science field trips
content outline or "web"	stapled together or bound	parents as mentors	library open for research on Saturday and one evening per week
integration with writing	improved quality of copy	parents to give feedback to teachers	materials and equipment
integration with math	separate 3-ring binder for science	Tell parents what their responsibilities are regarding the science program.	Ask parents what skills they can offer to science program.
	key words in italics or bold	suggestions for parents to help children review	
		kids to teach parents - parents to report back	
		parent network for helping parents to help kids	

Improved Consistency	Improved Communication	
	Content	Format
same packets for all students in all clusters at each grade level	"study guide" for parents	"Lion's Roar"
notetaking skills	deadlines	meetings with parents
rubrics (especially for projects) - clear purpose, cost limits, role of parent	history of science program organizational plan of program	letters to parents
numbers and kinds of activities and homework assignments	textbooks as resources	signing tests
connections to real world	enrichment suggestions	Friday folders
enrichment: files of articles, books for supplemental reading, bibliographies	deadlines and checklists for students (teachers to check)	tear-off sheet for parent responses (with deadline for response)
assessments	results of surveys, focus groups, work of PIT	ongoing PIT (meet 3 or 4 times per year) - names in "Lion's Roar" as resources
required oral presentations on current science topics (formalized)	explanation to parents about what help is appropriate	
	parents to share articles or periodicals of interest	
	awareness of effects of peer pressure (on genders, ability groups): parents, students, teachers)	

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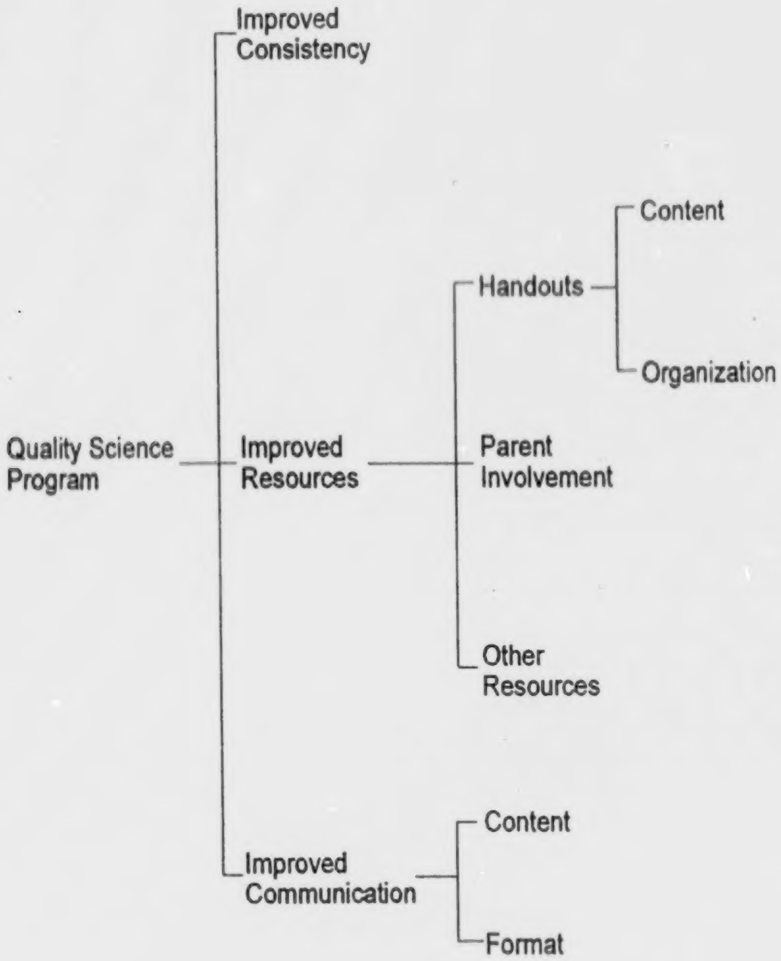
APPENDIX O

Tree Diagram of a Quality Science Program (as Perceived by Members of the Project Improvement Team)


Quality Science Program
Improved Consistency
Improved Resources
Improved Communication
Handouts
Content
Organization
Parent Involvement
Other Resources
Content
Format

In my work with the Project Improvement Team I prepared a Tree Diagram that measured 24" X 36" in size. I was unable to replicate that entire document in its original form for this dissertation because of the amount of information that it contained. The categories and strategies listed below complete the general outline of the Tree Diagram that is shown on the previous page.

Improved Consistency

same packets for all students in all clusters at each grade level
improved notetaking skills
rubrics (especially for projects) - clear purpose, limit on cost, roles of parents
numbers and kinds of activities and homework assignments
connections to real world
enrichment - files of articles in each classroom, bibliographies, books for supplemental reading
assessments
required oral presentations on current science topics

Improved Resources

Handouts - Content
"flow" of course
connections to previous learning
summary of unit
content outline or "web"
integration with writing
integration with math
science

Handouts - Organization
pre-numbered pages
syllabus
hole-punched
pages stapled or bound together
improved quality of copy
separate 3-ring binder for

key words in italics or bold

Parent Involvement
"wish list" of reading resources (parent to organize and maintain)
parents as resources in classrooms (e. g. as guest lecturers)
parents as mentors for students
parents to give feedback to teachers
Inform parents about their responsibilities regarding science program.
suggestions for parents to help children review
parent network for helping parents to help kids

Other Resources

after-school mentoring
technology
science field trips
one notebook PC per student
library open for research on Saturdays and/or one evening per week
materials and equipment
Ask parents what skills they can offer to the program

Improved Communication

Content

"study guides" for parents
deadlines
history of science program
organizational plan of program
textbooks as resources
enrichment suggestions
deadlines and checklists for students (teachers to check)
results of surveys. focus groups, PIT work
explanations to parents regarding what help is appropriate
raised awareness regarding peer pressure (on genders, ability groups): parents, teachers, students
communication to parents to share articles and periodicals that are relevant

Format

(school newsletter)
meetings with parents
letters to parents
signing tests
Friday folders
tear-off sheets for parent responses (with deadlines for responses)
ongoing PIT (meetings 3 or 4 times per year - names of members in (newsletter) as resources

APPENDIX P

Sample of Follow-Up Letters to Members of PIT

June 3, 1995

Name
Street
Town, State Zip Code

Dear ____:

The purpose of this letter is to thank you for the hours that you have devoted to our continuous improvement effort in science. I especially appreciated your abilities to listen attentively, consider carefully, and then contribute insightful comments that frequently served as consensus statements.

Enclosed is a copy of the transcript from our interview which I thought you might like to have. If you feel that I have misinterpreted or misquoted you, please let me know.

We have lots of work ahead of us, but thanks to you and the other members of the Project Improvement Team, now we know exactly what to do. We have finally moved beyond guessing what is needed.

I am very grateful for your help and look forward to working with you again in the fall when we meet to plan our Science Parents' Night and to finalize our handouts and articles.

Very truly yours,

Virginia C. King

APPENDIX Q

Sample of Large Chart of Demographic Data

The ten large charts contained the topics that reflected the major concerns of the parents as indicated by the parent survey and focus groups. These included: resources, projects, laboratory/hands-on experiences, technology, teachers/teaching, and parent involvement. Data for the demographic categories of each chart were identified by various colors of paper.

Following is a sample of one topic from the Needs/Reasons chart sorted by the grade level of the child of the respondent. On the original chart, grade 6 data was on green paper, grade 7 on pink, grade 8 on yellow.

Grade 6

Needs: Survey is unnecessary.
Reasons: Spend more time teaching, less time procrastinating.

Grade 7

Needs: Ask people in science fields.
Reasons: These people can truly evaluate program.

Grade 8

Needs: Do not need this survey.
Reasons: Spend time instead on developing existing programs. These surveys are not constructive.

Needs: If you want opinions about the science classes, ask the kids.
Reasons: Kids know what is going on, not the parents.

Needs: More parent participation.
Reasons: Participation has not been offered.

APPENDIX R

Focus Group Notes

Wednesday, 2/22/95, 8:00 A. M.

Reading Resources / Review Materials

- Are you planning on adopting a textbook? (Researcher replied with a brief explanation - program based on NSTA and AAAS guidelines but locally developed, includes many different resources, no text available to match program project improvement team to develop plans for supplementing materials which could be a locally developed "text," bound packets of handouts, etc.).
- Can quality of copy in packets be improved? clarity of print? Is the reading level of some of the material too high? some out of college texts? others out of newspapers? Seems to have improved this year, so improvements may have been made already.
- What is missing is a good and logical "flow" of what is to be learned. - - There is a need for objectives to be clarified for parents and students.
- One positive aspect is the integration with the math curriculum, e. g. decimals with atomic weight in chemistry. If vocabulary is an issue, would it be possible to teach science vocabulary through language arts. - The CMT is ultimately going toward facts plus writing.
- The quality and wealth of information in the science curriculum are very good - be it from college texts or other sources. However, it is hard for parents to help their children because science materials are not organized. It is hard for me to skim articles, not having been in class, and pick out what might be important for kids to know on test. This would be clearer if there were a text.
- The success of the program is dependent on the ability of the child to do the work on his / her own.
- There is a need to provide help for kids to organize their materials: a system? handouts spirally bound? webs or outlines? pre-numbered pages in packets?
- Parents have more difficulty than do students.
- Seventh grader complains about excess notetaking in science. Can there be more of a balance between notes and actual science? learning about science versus doing of science? Should have handouts with notes only to supplement handouts. This would be a better use of time.
- Can 6th grade language arts teachers help by teaching notetaking skills? Notetaking is not the purpose of science.
- Can reading, handouts, and notetaking be more balanced?
- Science should be primarily doing, printed matter second.

- Teachers must address different learning modes of students. (Several parents offered other perspectives - some that the process of writing something provides reinforcement that is better than highlighting handouts.)
- Fear of textbook: There is a danger that adopting a textbook will lead to rigidity in teaching because teachers will feel need to "get through the text." Teaching needs to be more flexible than what usually goes along with a standard text. We don't want to turn off kids. Look at H. S. and how few girls there are in some A. P. science classes.
- Have you communicated with H. S. at all? (Researcher described meetings that had been held, some interest developing regarding making earth science more lab oriented, NSTA suggestion to have spiralling curriculum in place through grade 10, etc. Also, unusual thing happening in Newtown in that MS had developed program for needs of kids - no direction from HS.)
- Why is HS not following NSTA guidelines? (Researcher described certification issues, need to prepare kids for AP tests, college requirements, buy-in of good experienced teachers who have been teaching successfully for so many years. Change must come slowly, cannot be forced.)

Projects

- Can school identify its human resources and gather a list of parents who are willing to volunteer as personal mentors for students? Less a matter of curriculum and computers than on using what expertise is available.
- School projects are important and should foster an interest in science fairs.
- The issue of projects centers on time expended versus what is actually learned, individual grades being dependent on others' work and "glitz". Grades should also reflect depth, research skills, integration of information, awareness of whether work was done by parents or student. Rubric should reflect glitz, research, content, etc. Teachers must define expectations in advance. Grades should not depend on what parent has spent.
- Are we discussing perceptions or reality? Maybe, parents have perception that there are problems when there really aren't any. Should explain science program to parents
- Group work can be a problem. Individual grades should not depend on lack of work by unmotivated students. Kids do need to learn to work in groups, but grades should not depend on this.
- Standards must be defined. Grades should be given to individuals only. Hardworking students should not be penalized. Teachers should de-emphasize group work.
- The reality is that groups are part of the real world.
- Teachers on each team should communicate. Groups should include equal distribution of all types of kids. Kids should be trained to work in groups, and teachers should supervise and oversee working of groups.

Equity / Consistency

- I have advantage of teaching on a faculty for a five years in which there were MS and HS kids on same campus so we could easily plan for grades 6-12. Must consider relevance of middle school science program to high school and college prep offerings. There must be vertical and horizontal consistency. The middle school program should be hands-on, with a focus on discovery, grades 9-11 should ensure mastery of basic concepts, grade 12 should hone those concepts in A. P. courses. I am hearing a question of how we can we improve our college prep type of program here at the MS. Middle school should, therefore, offer a broad base of connected experiences that are relevant to life. They can then bring this to the lecture courses of the 9th, 10th, and 11th grades. We have emerging intellectuals who are still at somewhat of an animal state (laughter) in their development. Should have 3 years of well-orchestrated, hands-on, discovery.
- Parents know who are solid and who are weak science teachers. There is a perception that no one (administrators?) cares or is checking. This is why there have been so many cluster requests in the past.
- Can feedback be collected from students and parents during the year (some sort of ranking of teachers) and this information used for accountability? Parents should not need to ferret out good teachers and request placement for their kids.
- Attitude changes are difficult for all - parents, teachers, students. Buy-in to change can also be difficult. How can weak teachers be improved? model teachers? training?
- Kids come from 4 different elementary schools which have placed different emphases on notetaking, webbing, and other skills. Therefore, there is inconsistency in kids' backgrounds. (Researcher described how survey data is being sorted by five demographic questions, and that this may provide some pertinent data. Presently, the fifth grade teachers are meeting to plan for providing equal opportunities for Newtown students. They recognize that equal qualities in education are important. Teacher who was present contributed that kids from every school have strengths and that she is seeing more similarities from different schools each year.)
- There is a need to communicate the goals of the new program to parents. The program needs their support. P. R. is important. P. T A leaders are frustrated by parents who bad-mouth schools and teachers but who never read what is sent home and are ignorant and unaware of the good things that are happening in our schools.
- Are there adequate materials, demonstration equipment, and supplies of science literature available in classes? For example, Tuesday Science Times? Do kids see real world connections? Teachers should not need to locate teaching materials themselves.
- It is important to teach so that everyone reaches a certain level of competence plus stimulate those who wish to go beyond. I have concern

with the second of these.

- More structure is needed: "Here is the curriculum. These are our materials and resources. This is what you will do."

Note: Time ran out. Last three issues not addressed. Must budget time in other groups.

Wednesday, 2/22/95, 4:00 P. M.

Reading Resources / Review Materials

- Use texts as resources only. Have many different ones on hand for kids to use.
- Science "sheets" no good if child is disorganized. Is there a way to bind them?
- Parents are comfortable with texts. Maybe, every child should have a separate 1" notebook for science handouts. This might suffice as a text.
- Is there a need for more technology? more student initiated research projects in which kids pursue interests via telecommunications networks or by networking with other schools? The grade 7 research on diseases (each child researching a different disease, reports to class) was good.
- There is a need for kids to see real world connections. Should bring in local "experts." I wonder how feasible it is to ask "experts" to give up the time it would take to reach four classes of kids on a team. Many can give 30 minutes or an hour but cannot give a whole day.
- Current articles are needed. O. K. to ask students to locate articles.

Projects

- Teachers should not load kids with projects! There are often several due at once. Teachers should coordinate tests and project due dates.
- Can more projects be combined? Example: science and social studies?
- School should set a dollar limit on money spent on projects.
- Students should not be graded solely on artistic ability. Many projects are graded solely on "glitz."
- Teachers should establish grading rubrics when assigning projects.
- Teachers should encourage parents to talk to kids about science issues in the news / real world.
- Ask kids to submit questions for others to answer about their projects. Example: How many muscles are in your arm?

Hands-on / Lab Experiences

- No labs-hands-on taken home in grades 6, 7, or 8. Projects and lab sheets have come home.
- I hear very little from my child: little homework, some simple tests (grade 6).
- Little communication from child. I never sign tests, etc. This would be good for consistency, equity, communication.
- Communication is needed. Friday folder? e. g. "For next six weeks we will

be doing.... If you have expertise in this area, will you...?"

- My children are very independent in doing their homework (grades 6 and 10).
- I see a great deal of enthusiasm. Bone / muscle project was very good.
- Why not put an overview of the science program in the handbook?
- Do we need more labs. or is this just a lack of communication?
- My daughter seems to be tested only on facts, and she studies only facts to prepare for tests. Maybe, there should be a lab grade and a test grade, ad together they could be a course grade. - There is a need to tie assessment to labs - performance based assessments, portfolios. I saw this in the elementary school and expected it here. If teacher doesn't feel comfortable doing this should go to a workshop to learn how! This could help with equity and uniformity. There is too much emphasis on facts and figures. When one teacher has to teach only one subject - science - the science experience should be great. I feel my daughter got more when she was in elementary school and teacher taught all subjects.
- Teachers must make science exciting and remove the "mystique."

Attitudes: Males and Females

- daughter finds class boring, but is not a science-oriented child - sees science as memorizing (F)
- daughter is a very good memorizer
- son loves science
- Both sons love experiments. I am worried about safety because I find them mixing things together at home. High enthusiasm.
- I see interest in my two sons going up and down. This may be related to the topic.

Parent Involvement

- Focus groups are comfortable for parents. I can say things here that I would not say to teacher because there is no fear of repercussions. This is much easier than one on one with a teacher.
- Signing tests is an easy way to involve parents. It's a great way for parents and teachers to communicate.
- Parents are on guard about committing themselves because time is so precious. They are afraid of overcommitment.

I suggest that teachers at each grade level send home a description of each new unit to parents at its onset. Ask parents to serve as resources. Describe unit. Ask if there is anything else that parents feel should be covered in unit and if they have expertise that can enhance the unit. Have a tear-off section for responses.

Note: Equity / Consistency issue was not addressed in this focus group due to lack of time.

Wednesday, 2/22/95, 8:00 P. M.

Reading Resources / Review Materials

- The Tuesday Science Times is a great resource. Question and answer part is valuable. May be over kids' heads, but teacher can help kids to digest it.
- Curriculum should use articles from periodicals. One called Earth was great, but when I went to renew it, it was no longer being published. Sixth graders must be taught organizational skills for reviewing for tests.
- I feel there are enough materials but that they need to be organized for some kids. Sometimes, my son has everything, other times, handouts are missing, and I have no way of knowing what is missing or what its order should be.
- Is there a way of setting some sort of order to handouts to help kids who need organizational skills? Packet or some other way to help kids?
- Is a text needed for depth? Should text be a reference book only? If unit is 30 pages of text, and child is tested on only part of that, text still supplies added information that can give depth that interested student can use to get to true understanding.
- I suggest that each child be given a bound copy of each science unit and that it be organized like a textbook: vocabulary, etc. Each strand could be separate so that they could be rotated to students in other clusters. Or, packets could be three-hole punched, sent home in Friday folders, reviewed by parents and child, inserted in s separate science binder. A study guide for parents? Some parents wish to enrich their kids' learning. Researcher commented: This could be expensive, and there is a question of whether such a "text" would survive book bags and lockers. Parent replied that each child should be given own bound or, at least, stapled packet for each unit and should be encouraged to write in it or highlight. This must be cheaper than buying texts, should be sent home in Friday folders, kids could have special binder just for science handouts.
- I like idea of outline and bibliography. Also, kids should be doing on-line searches.
- Have parents sign tests, projects, contracts, handouts, etc. as means of communication. I love signing of tests as a means of keeping informed.
- What should line be for parents to help kids? I work very hard, then I go home and help kids. What kind of kids are we (am I) creating by being so available? Is this germane here?
- Could MS teachers prepare packets and give them to kids on microfiche or floppy disks? hard copy for others?
- Consider using CD ROM and computer as texts. Buy a notebook computer for each kid, let them go home. If they break them, they pay for them. Another father suggested that he'd like his kid to have the old one so the replacement cost would be lower if it was lost.

- Two problems: I may be old-fashioned, but I believe that textbook represents foundation for other materials. Structural problem also exists, and this is one of organization.

Projects

- My wife used to agonize over every comma on our sons' projects in elementary school. Eventually, they learned.
- Kids like projects, hands-on, labs, field trips.
- Teachers must plan deadlines and communicate these with each other. Seems as though due dates are too close together - need better planning in school.
- Flip side of this: Should kids experience pressures of deadlines as a reflection of real life? We should be giving kids tools to cope with real life. I do help them, and it would be great if everything in their lives could be coordinated, but this is not the way of the real world. They must learn about the pressures that exist in the real world.
- I have 3 children. I have always said to them, "Tell me what you need and if you get stuck." That is my way of helping. My daughter who is a senior has stayed up all night, but I view that as her problem, not mine. I would not stay up with her, type it for her, or anything like that.
- Teachers should announce deadlines and train kids to budget time.
- Teachers should have intermediate checks on work in progress: outline, rough drafts - and look on these as milestones rather than handholding.
- Projects can be used to draw connections between the disciplines. Every project should connect at least 2 of the four science strands.
- I personally hate science. When they have to do a project, it becomes blatantly obvious which parents have worked with kids and which have not. Mine cannot compete. I saw one thing this fall that made me hopeful. Teacher had outlined expectations in advance. If student met these, he/she got 100% regardless of what it looked like. I don't believe grades are everything, but students should know that parent work on projects should give them either advantage or disadvantage.
- Students must ask, "Why?" It is not enough to regurgitate facts, make a beautiful display. Example: 7th grade project on recycling should have emphasized critical thinking rather than facts. Kids should also learn opposing viewpoints.
- I also had a real problem with that project because of the amount of waste that the project itself generated in terms of "stuff" that would be in waste bins as soon as project was grades. Can't kids at least use backs of posters.
- Kids are being taught that dominant emphasis in society is perception - for example, how project looks. Fact is that we are judged on how things look.

Consistency / Equity

- Science should be connected to math. Kids should be responsible for equally. I may get shot for this, but I believe it is true. There are exceptions though - some girls excel at math and science. (Two others disagreed - men whose wives had been science and math majors. One said both son and daughter hate science in spite of fact that mother found it so easy.)

Parent Involvement

- Guest lecturers or visitors to classroom would be stimulating for kids would give kids break from regular teacher..
- Parents should have opportunity to assess teachers semi-annually or at end of each year.
- Reason for inconsistent answers regarding parent opinions of appropriateness of parent involvement (same question asked 2 different ways on survey) is that I felt I had already answered the question once, could not see why it was there again, so I skipped it.
- Parents should help kids but not do their work.
- I suggest a summary sheet for parents at the beginning of every unit: outline, bibliography, locations of reading resources. Also, give out packets early.
- Better communication with parents is needed.
- Projects can be nightmares for parents and may tax their resources and their expertise. Teachers must establish parameters of projects. Kids should receive grades of 100 if parameters are met.

Thursday, 2/23/95, 1:00 P. M.

Reading Resources / Review Materials

- If child is unsure of something, he/she needs a detailed backup of reading resources. Needs something to fall back on, more back-up. (Researcher replied that old texts had been divided among all teachers - one classroom set of life and physical science in each classroom, but there are not enough to assign them to each child. Child can sign them out.
- It is hard for many students to keep resources organized.
- Handouts and a science journal are very helpful. Kids make own journals.

- Stapled handouts and portfolios are helpful for organization.
- Kids have difficulty locating homework worksheets. Homework buddies and cooperative groups are valuable in this regard.

Projects

- I like the idea of projects because it gives kids opportunity to work on their own.
- Projects are O. K. but kids rely too much on parents because subject is sometimes over the heads of the students. Example: measuring lung capacity. Teachers must be sure that kids understand procedures. I gave

quantitative aspects. I was member of math curriculum committee. We agreed that the logical place to connect math to real world is through science. This was a big issue with math committee.

- I have colleague who believes that smarter kids should be helping slower ones. This is way it was done in his country (Paraguay). He feels that gifted kids should not be segregated off. I was thinking about Discovery and reading groups in elementary schools.
- Can the school offer after-school mentoring opportunities for extra support if kids need extra support? Underachievers might resent this, but if even a half hour per day could be set aside for gifted kids to share ideas with others, it might be good.
- Can teachers be rotated so that kids are not exposed to either a strong or a weak teacher for a whole year?
- Parents perceive differences in practices in different clusters. Example is amount of homework assigned.
- There should be equity in number and king of activities offered in different clusters at each grade level.
- Communication is the key.
- Teachers must meet special needs of kids.

Hands-On / Lab, Experiences

- Anomalies: Science teachers I had would purposely give wrong data so we could assess what we did wrong. Everyone then eventually got right answer. I am afraid kids go away from labs today learning something that is totally wrong.(Others disagreed with this. Some stated that they had fudged data to make labs come out right.) How do kids get from problem to answer is real issue.
- The scientific method should be applied to projects as well as labs. Scientific method should be first sheet of handouts. (Father had not seen lab sheets.) Kids learn scientific method but do not apply it to projects.
- Hands-on good for developing positive attitudes about science. Need to instill in the a sense of commitment and responsibility, a feeling of a job well-done. This will give them a sense of exhilaration which is fundamental to attitude development.
- Students should be given credit for critical thinking, methodology, etc - not just results. Example: daughter had to boil mixtures and determine which ones boiled faster. Experiment was not controlled, and she did not understand why some boiled faster than others.
- Students should assess variables as causes of outcomes.

Attitudes: Males and Females

- I believe there are basic differences in the ways males and females learn. This may change eventually.
- Female science teachers are important as role models for girls.
- Daughter likes science but son does better at it. I agree with studies that say that boys are more adapted to science and math. I help both of them

her a real lecture on scientific method, but I have a scientific background and was able to help her. Other kids may not be able to rely on parents.

- Kids often miss basic concepts. Example: Eighth grade model of element project had many handouts, but daughter was still confused.
- Can kids explain why they are doing projects? Example: 7th grade recycling project. Kids spent lots of time researching. Can kids explain what they learned and why recycling is important?
- There is inequity when projects are assigned because some parents have science backgrounds and others do not. Therefore, some kids have an advantage. This is very apparent when I come to school to view projects done by kids on a team.
- Parents should encourage kids to do work alone.
- My 6th grader has done only one project all year - comparison of absorbency of paper towels. He asked his older sister what she had done two years ago and then did same thing.
- If child is precise, projects can be very time-consuming. This can impact time spent on other subjects.
- Planning is hard for young children who cannot estimate how long something will take. It is important for teachers to establish checkpoints for outlines, drafts, etc. Most teachers seem to do this, but some don't.
- Not all families own computers, and most families rely on buses for transporting kids to school. Therefore, many children cannot take advantage of before and after school hours to use computers for projects. There have been times when my three children needed to do things on computer, and we actually had to set up schedules for computer time at home. (Researcher added that library and computer lab are both open before school, but that others have expressed difficulty of driving kids in early because of parents' work schedules.)
- Friday folders should be used to remind parents of deadlines, e.g., notice regarding due dates.
- Homework sheets in study skills packets are very helpful.

Consistency / Equity

- Different clusters have different numbers of study periods. Example: Some seventh grades have two per day (short periods before and after lunch), others have none. Is this a perception or a reality? Regular study halls alleviate pressure. I don't know what is right number, but I feel that there should be consistency across grade level. Son did not have study hall at beginning of year but now does. He now feels much less pressured.
- 6A assigns more projects than 6C.
- Is there equity from one elementary school to another? I don't see this.
- There is inconsistency from teacher to teacher in the elementary and middle schools and also between the elementary schools. (Researcher added that there is a balance between having same objectives for all kids and restricting teachers to same activities. Many different activities may

lead children to achieve same objective. Teacher must select.)

Hands-on / Lab. Experiences

- Many labs in eighth grade, few in grade 6, remember dissection in grade 7 but that is all. Did every sixth grade do the chicken wing lab? Does every 6th grade use the lab? (Wendy described shared 6th grade lab. but that it was not necessary to do all labs in that room.)
- Kids love labs.
- There are many opportunities in Connecticut for hands-on experiences: Sherwood Island salt marsh, power plant tours, visits to the nesting sites of eagles, a parent (Mr. Yarish) who does research on seaweed.
- Experts can visit classes to add perspectives. (Wendy expressed problem with busy professionals who can give one hour but not a whole day. "I can come in for my son's science class.")
- School should offer before school times for kids to make up labs.

Attitudes: Males and Females

- Both my son and daughter think science is dull. My daughter is more positive than my son.
- One problem girls have with science is that they perceive the math aspect to be difficult. Example: Girls at high school perceive that boys have easier time with A. P. calculus.
- Teachers should be trained in learning styles. Example: Research has shown that girls ask more questions as they learn, but this does not mean they are not learning. If teacher has perception that boys are doing better, then kids pick up on this. Teacher may interpret this as a lack of understanding when it is actually a search for greater meaning. More girls in A. P. chemistry than in A. P. physics.
- Kids often make fun of high achievers. Peer pressure on achievers is more of a problem than on sex differences. Misbehaving students, who are often male, take learning time away from motivated students.
- My daughter is amazing her older brother who is taking chemistry . She is definitely getting a higher level of science instruction than he did.

Parent Involvement

- Invite outside experts to provide up-to-date information on seventh grade hazardous waste unit. Must sort facts from propaganda.
- I like the spiralling curriculum. It makes sense.
- Parents should discuss science work with kids and question them about specifics. Together they can look at encyclopedia and add meaning.
- HS should tell kids to take AP exam in biology after course in grade 10. Should also let kids take AP Biology in grade 11 rather than wait a year. Kids forget biology they learned in grade 10 by the time they take the AP exam in grade 12.
- Teacher accountability issue: need math skills.
- Parent involvement is important because parents know own children. /their perceptions will, therefore, be different from those of the teachers

who see the kids only in school.

Tuesday, 3/7/95, rescheduled from 2/28/95 (snow day), 8:00 A. M.

Reading Resources / Review Materials

- All three seventh grade parents agree that text is badly needed in seventh grade (less for other grades). Is this due to content of seventh grade curriculum or to some other factor?
- Seventh grade environmental unit is good. Kids need more of this.
- Sixth grade was largely repetitive. Science needs to be exciting because it is the basis of many jobs.
- Science should be integrated with other areas. Writing is especially important.
- Science instruction needs to be at a higher level all along, especially at Middle School.
- Need varied resources.
- Kids need better notetaking skills, especially if there is no text. Earth science at high school is totally dependent on notes.
- Handouts can be an alternative to a text.
- Kids and parents should be given a syllabus. Texts must be available as references. School should communicate to parents about how science program uses texts as references.
- The computer is a great resource. America On-Line is especially good. Teachers should stress use. One day per week should be set aside for after school research in the library.

  Teachers should stress all resources and raise awareness of what is available. Suggest a scavenger hunt with a prize for the group that finds the most numbers of or most unusual resources. My daughter found that there is a publication called the "Gorilla Newsletter."
- Would it be possible to open the Middle School library for students to use on weekends?

Projects

- Projects often assigned to groups at Middle School.
- Projects should be graded on both content and display. Should state a clear objective, what is done, conclusions, include oral presentation. Scientific method should be applied to projects.
- Projects involve parents. It is good for parents to know what is happening.
- Children should explain what they have done. This is more important than the display.
- My second child is now at the Middle School. He usually is given a choice of an individual or a group project. If child has a group project, parents should be able to insist that others in group live nearby. Newtown

is a big place.

- Kids learn in 3 ways: teachers teach, students teach, students teach selves.

-Good students want to do well. My kids did not want to spend a day skiing with us because they had projects to do. Teachers should give more than a weekend for big assignments.

- Science should be celebrated. For a model, look to the celebration of states that is held at Sandy Hook; it is a "game" with a knowledge base, Science celebration should be coordinated with math.

- It would be better to put computers in science classes than in the library. Teachers must know how to use them (interactive videodiscs, America On-Line). Kids could sign up for times to use them.

Consistency / Equity

- Quality of children's experiences varies at Middle School.
- In Middle School kids should find excitement and a sense of competence. It is less important to memorize. e. g. Study of elements involves mindless memorizing of formulas. Even balancing of equations is not meaningful.
- The main reason parents do not like projects is because they don't like to be burdened with them.
- It is important to go and view - e.g., the Smithsonian - and relate to classroom activities. Every year - 6, 7, 8 - every student should go to a museum and view specific things that relate to science program. Group leaders should be instructed on how to lead the kids.
- Consider having the kids evaluate their teachers. They know who is good and what they do.

-Observe to see if teachers are all following curriculum. (Researcher explained that coordinators will be in classrooms this spring for this purpose.)

- Insist that science teachers use CEUs to update selves in science.
- Network with colleges.
- Both teachers and students should be accountable.
- Better students are often not challenges. This can lead to declining work ethics.

Hands-On / Lab. Experiences

- Labs. are more important than projects.
- Field trips such as the one to the pond should be started in elementary school.
- Demonstrations are not enough. Kids should do work themselves. (Wendy explained that all eighth grades have full labs, sixth shares.)
- School should offer opportunities for students who are absent to make up labs.
- Kids should know that it is O. K. if the lab. "doesn't work." Science is not exact. Kids are afraid of failure.

Attitudes: Males and Females

- Girls should be encouraged in science. Suggest doing a study of achievement of girls who study science only with other girls versus those who study in mixed classes. Track one class of girls who are separated form boys for science.
- Hands-on activities may encourage girls.
- Math team is composed mostly of boys.
- Team boys with girls when they are doing labs.
- Attitudes depend on presentation of teacher.

Parent Involvement

- See what is happening in either Wilton or Weston. They have a formal science mentor program.
- Parents may be involved in science by doing demonstrations in classes. Kids will remember this.
- Some kids will be sensitive to having parents in middle school classes. They may not like this.
- Prepare a resource list of parents. If parents cannot spend a whole day in a class, they can be rotated so that each child hears at least one "expert" each year. (group 1 hears first presenter, second groups sees second, etc.)
- Survey local corporations to determine what kids need to be employed in science related fields. Plan program to meet these needs.

APPENDIX S

Sample of Transcript of Project Improvement Team Meeting

Thursday, 5/25/95, 8:00 A. M.

Res.: I think our work is getting close to done. What I put on the table was a rough draft of the three pieces that you asked for in terms of communication to parents. I don't know if we need to hold meetings on each section, send each home separately in Friday folders, send it all home together, have one parent meeting, or whatever. Someone suggested that we some sort of informational meeting for parents. Maybe we should do the informational meeting and then hand out the whole packet. I started working on it because it was all in my computer, and I thought that I would give you whatever I did have. I could not remember all of the names of the members of our Panel of Experts - Wendy and Tom.

Teacher 1: I have them written down somewhere.

Res.: I have them, too, but I didn't think to look them up, so you will see a blank space after the names I did remember. I'll fill in the others. (name of one member of Panel of Experts). If you will look this over, and give me feedback if you wish to do so. I also think we need to reexamine the tree diagram to see if anything else needs to be moved into the categories of improved communication or consistency that will be worked on this summer. Then, we need to develop a plan to get work done.

(Silence)

Res.: Some of the things under Organization of Handouts probably also belong under Consistency - pages hole-punched?

(Silence)

Teacher 2: I'm looking at the last page - important components of an exemplary science program - lectures... (laughter) There are all of these good things about the importance of the science program, but when it comes down to "the science program is exemplary," only 40% ...

Res.: I think that a lot of people thought it was good, but maybe not exemplary. Bill, didn't you raise this question? That the question might better have been worded with choices - exemplary, very good, good, poor, etc.
Parent 1: That was my question.

Teacher 1: I'm looking at the chart. Why are rubrics separate from assessment?

Res.: I think this was alternative assessments - to make sure that there are clear guidelines for each assessment, and the other one was to make sure that there was some sort of consistent theme - as to the kinds of assessments that were being administered.

Teacher 3: Last year or the year before, you held conferences with some students...

Res.: Do you mean the focus groups?

Teacher 3: focus groups... and you talked about - I'm looking at the rough draft on page 3 - and you talked about the quality approach... I make it a practice in my classes to ask, "What would you like to learn? What would be really fun? In the few days remaining this year, I have given my students a choice between sound and space. Could we see the results from last year?

Res.: What really came out of that... We did a survey. That was what made me realize that a survey can be confusing because there were 5 or 6 questions - Do you feel like you are learning a lot? The only question that elicited any kind of negative comment was on the quality of the homework assignments. The kids felt, "We're doing all of this great stuff in school, but what happens at home is dittos or having to read something that may or may not be connected to the classwork." They did not see the connection between the homework assignments and class and particularly the way they were being asked to do it. Since then, teachers have been trying to make the homework be as hands on as possible. That is what came out of that.

Teacher 3: How about when you had them in here?

Res.: That is what we found. The survey said, "Agree or disagree - My science homework helps me learn." The kids wrote, "No." Then we ran focus groups to find out what they meant. They did give us clearer information. The kids, by and large, liked the science program. After that, there were still rumblings in the community which led to this Project Improvement Team. It isn't the kids that are concerned about the program at this point. It is the parents.

Parent 2: Virginia. I've been wanting to make a comment. I was not here for the last meeting. I did reread all the information. One of the things that hits me about communication is that we have a list of things to do - I don't know how to phrase this - I think we need a climate in which to begin. We need to establish a basis of trust and commitment on the parts of the parents who are here and others to be able to face teachers and say, "This is what we need." Teachers need to able to say to parents, "We need this from you and this from your children." I think before any of those things are effective there needs to be some statement that is the commitment.

Res.: Where would that fit? A parents' meeting to explain this to parents? In the opening paragraph of the handouts?

Parent 2: I would think in the opening paragraph - a statement that our commitment is continuous improvement is to continually improve the climate for continuous improvement of communication. I think, to some extent, that would address a lot of the issues that (Parent 3) raised about teachers. I think if parents had a format - if they have a problem with a teacher - what do they do? If they do not feel they can go to a teacher, what do they do? If the door is opened, or if there is a way to address a problem, and you have faith in all of the people that are involved in the problem, that is to say, "I believe the administration, if I come to them, will address my concerns. I believe the teacher will address my concern. I need you to believe that as a teacher you have a concern for me that I will address that with my child." I'm not sure I am saying this quite the way I mean it, but I think this needs to come out.

Teacher 3: I think that is wonderful - the way you phrased that. We need to be working together rather than as antagonists - not wait until there are major problems and everyone is frustrated or at their wits end.

Parent 2: And the dialogue that... I mean we say we are trying to get the children to respect each other - I think the only way to solve the problem is that if you go to someone with a "this is what I need" - not a "I hate this, I hate this, I hate this" - and the response is, "What can we do?" or "How would you like me to change it?" or "What would like to do to help change it?" rather than everyone getting angry and turning off before they even have a conversation.

Parent 4: What if we had a contract that was signed at the beginning - a simple contract that said, "Our goal for this year is to work together" or something that the teacher would send home at open house or the first day of school or whatever that would have to be signed by the student, the teacher, and the parent. This could give us all an idea of what we are going to agree to throughout the year, and maybe along with that a simple form that if ever anything occurs, this is the form that you use. Just send it back to school, and maybe it would go through guidance or maybe through the principal's office or something so that everyone knows if anything comes up, this is what we do. And the teachers have the same form, and if something is wrong with my communication with you, as a teacher, then I am going to send this form home to you as well - so that we all know how it will be handled.

Teacher 3: I don't think that contract is a nice word. I cringe because we tried it once, and one parent refused to let the child sign it. "No, no, no. You have no right to do that." This took us by surprise. More of a trouble-shooting procedure... What are the steps that I follow if something isn't working the way that we hoped it would. I love this paragraph - (Parent 5 - not at meeting) wrote - talking about (Parent 5's company) - How am I going to be able to record, in some quantitative manner, the degree to which we have implemented what we are trying to do. And then he says in a gentle way - Even though we are so well intentioned, and I think we are here, sometimes what we think will work just doesn't. Our trip Friday - it was planned perfectly. It just didn't work. So, now what do we have to do to make it better? Instead of being part of the problem, start being part of the process. If someone just complains, that person becomes part of the problem.

Res.: One of the things that we talked about last week, (Parent 2), was that we might have an ongoing Project Improvement Team - names in the (school newsletter) - perhaps an informational meeting with parents to introduce the members of this ongoing Project Improvement Team. Hopefully, some of you - if necessary we will bring in other people - people who will understand what we have been doing here. I have sensed that this has been a very collaborative group. I have felt really comfortable here. There have been questions raised, but I have not seen anything that anyone can take personally. It's a matter of talking about issues not about personalities. And, if there are personalities that need to addressed, then that is something that people in the school need to hear. If we can just model this as a beginning, and let all parents and science teachers that this is the core from which it can radiate out... I mentioned to (Teacher 4) the other day, that during an interview for a position within the system, one of (Teacher 4's) colleagues said, "I really like what is happening in the science program, and I would love to do that." I didn't even know that he knew what we were doing! I ran right to (Teacher 4) to tell him! (Laughter)

Teacher 2: The statement that you wanted doesn't need to be just for science though. It can be for all curricula."

Res.: Everything that is up here probably should for everything, but I think we need to model it here. I don't think we can speak for others who do not understand this process.

Teacher 2: I agree with you, Virginia, that modeling is important. I think it is a lot easier for anyone to sit back and complain to themselves or to someone else than to take a risk and come here and bare their souls and make their little grumblings. I agree.

Res.: You are talking about parents and teachers...

Teacher 2: Parents and teachers and students. Yes.

Res.: I think your suggestion is a good one, and I think we can put that right into that opening paragraph. I wasn't very comfortable with what I wrote here because I couldn't condense it. We had said we would send out one page a week. I had an image of a double spaced page. We wound up with 7 or 8 pages - single spaced! I will need help with cutting out. I'm so much a part of the process that I do not know what is important for the run of the mill parent and teachers to know about - the people that are not involved in the process. I do not even know if they need to know that there was a Panel of Experts, much less their names.

Teacher 3: Maybe we just need highlights. Dates and bullets - short statements. Short and sweet.

Teacher 1: Right.

Parent 2: Is this something to go out intact, or a little at a time, or is this open for discussion?

Res.: I put it on separate pages because the way we originally talked about it, was to send it home in successive Friday folders. I pulled it out of different places in the transcripts. I tried to lump things together.

Teacher 4: I think you did a very nice job of going over this process that we went through. I think that the bullet idea is a good one, but maybe we should also include something in the (local newspaper) to tell parents that if they want to read more about the history of the program, that there will be - in the education section of the Bee - a thorough explanation of what is going on here. I think parents need to read it like this, too. I think the impression is better than just getting a blip with "This is what happened here, here, here, here." I think this reads very nicely, and I think it demonstrates a tremendous amount of commitment that has to communicated to the people.

Parent 2: I think a public forum...

Teacher 1: And we could pass this out... A meeting to explain this... don't you think?

Res.: The other question is when to do this. I really wanted to get the survey results out this year, but I think it belongs after we talk about the history of it, and I don't think we can do all of this now. And then we have all of these incoming sixth grade parents and the departing eighth grade parents...

Parent 3: I think we should do it in September.

Res.: Considering how slowly other data has gotten out, I think we are doing well because we did not even start until January. I really had this image of doing this quickly...

Parent 1: If you send out the results of the survey now, you have summer vacation coming up, nobody around. All of the questions that come up will not be addressed. If you send out something like this without all of the history, you need parts of the history in order to have an anchor or a starting point.

Res.: (Parent 1), you are seeing the dilemma I had while I was sitting at the computer!

Parent 1: Absolutely. You need that.

Teacher 1: What about parents' night? Can we talk about it a little bit?

Teacher 4: I've always done a little of this at open house. I have always talked about the program.

Teacher 1: And I have talked about the history.

Res.: We could do it at open house...

Teacher 1: And then do it again...

Res.: But remember, you have a very short period of time to talk about your whole program. Something like this... You could spend two hours talking about the process.

Parent 3: What if you didn't talk about your program? In the ten minutes or so that Tom says, "This year we are going to cover ______" - How many people actually come away from that saying, "I know that this year in science my son is going to get anatomy of the human body, CPR, and then space." I come out of those things with stacks of things, and with all good intentions, I get to the second page and say, "I'm never going to remember this."

Teacher 1: Right.

Parent 3: I'm going to take it day by day, project by project, week by week. What if you concentrate on this and then said, "I will be sending home outlines and packets as we cover different units." Then, maybe have a brief outline of the units so if someone asks what will be covered each year the teacher can say, "Here it is." One page - physical science, chemical science, whatever.

Parent 1: Don't talk as much about what you are going to cover as how you are going to cover it. What you expect the students to do, what you expect the parents and other teachers to do.

Parent 3: And, these are the changes we have made as a result of this committee. This year everything will be hole punched, there will be a notebook, we expect a highlighter - that kind of stuff. It's just an idea.

Res.: The problem is that there are seven other teachers that need to be brought up to date. Some of them will be on board this summer. All right. I think those are all really solid suggestions. I do have concerns about this (handout organization section of tree diagram). I did not want to do this without your permission, but I think this belongs under consistency. Doesn't it? Also, we never made a decision about whether or not to have a 3 ring binder just for science. That was in contention

Teacher 2: I sent out with my weather unit - and I know Wendy did it too - Wendy has 90, I have 45 (students) - my stack of papers to ditto all at once - I tried it - was like this - and I sent a separate packet for the parents, not the same I sent for the students - but information and a bibliography - I had a tear off slip on the bottom - I got one tear off slip back with a thermometer, and I know that the rest of the stuff...

Teacher 1: I think - one page...

Parent 6: It's the same thing in business. It depends on your audience. An executive does not want a packet. The parent will not read the nitty-gritty. Keep the bullets and keep it brief. Later on you can add more detail if you want to.

Parent 4: If you have bullets, and then at the bottom ask, "If you would like more information..." Some would like more... If we do not have a textbook - as in every other subject where they have a text in addition to the binder - and this is going to be their text - then I think you need to elevate it to that level that this has its own binder because this will be the text.

Teacher 1: How are we going to get it, Virginia? Have the kids pay for it?

Res.: (Teacher 4). Can this come out of the science budget? If we put it into to study guide material requirements?

Teacher 4: My budget get cut this year - less money this year than last year...

Res.: The cost of copying paper has gone from $16 to $30 in one jump, and it is going up again on July first. Apparently, many foreign countries are buying our paper and paying a premium. This is leaving us short-changed. A big chunk of tom's supply money is gone for this.

Parent 3: Which is more important - not to send reams of this stuff home - more of the tear offs for more information...

Parent 1: I think the bulk of the cost will be stuff for the kids.

Teacher 1: Absolutely.

Teacher 2. I had 5 pages for the parents.

Parent 4: I don't have a problem buying a binder for that. I think that since parents were so overwhelmingly in agreement that there is a need for better organization, one would think that the majority of them will be happy to help us to organize. And then, maybe we could just buy... I think a letter going home - maybe even over the summer - in preparation... We send notes home to incoming sixth graders anyhow, saying you must have such and such. From now on, you must have a 3 ring binder for this and a smaller one for this.

Parent 3: There will always be a small percentage of kids who can't buy it.

Res.: We have always been able to provide for them. We can put it right into the study skills handbook - This is what you will need.

Parent 1: I think this should go out in August when parents are buying supplies.

Res.: One of the things I do as soon as school is out is to revise the Study skills packet.

Teacher 4: I see this 3 ring binder as a specific style - a narrow one - plastic cover - one that if you are working at a lab station you can open up and it will not get ruined - indestructible. this one would not last the year. I guarantee that. What I am talking about is like a hard, thin plastic - have brought it up. About 1 inch wide.

Teacher 1: That might not be big enough.

Teacher 4: You rotate. You don't keep everything in there from the beginning of the year. After you are done with the unit, you have a place in the room or directions for where kids are to put that information. That is what they do in their other binder. "Now we have finished with this unit, let's clean out the notebooks to make room for the new unit. We could have extra ones hers, so if a kid lost one, or it got destroyed... ·

Teacher 2: What about a school store? My kids have brought this up at student council.

Teacher 4: We used to have one. (Special Education Teacher's) kids used to run it.

Teacher 6: Some schools have PTAs that have fund raisers for paper, pencils, notebooks and stuff.

Teacher 4: I didn't put that on my wish list for PTA. I could have put that on. Maybe they could help us.

Parent 3: You might be able to go directly to the manufacturer. Pentab or whatever it is. You might get some where the color did not quite come out right. Slight mistakes. As long as it will hold the paper. Covers not quite right?

Teacher 1: That's a good idea.

Parent 6: A couple of years ago Local company) donated hundred to Hawley. They all said (local company), but... Maybe a notice to parents - someone's place of business might have some...

Parent 2: Anything like this that we do should b publicized that it is, "In response to your concerns..." If you get any flack, it's not something you came up with. It is something people asked for. You are being responsive. That will, again, cultivate that environment.

Teacher 4: Right.

Parent 6: Another thing to keep in mind for the (local newspaper) is that it is not just for the parents. There is a general population out there that knows nothing about what you are doing here. When budget time comes, that will be important. More people who will remember that they just read something about science. They have a really nice program. Even if it is just one or two people...

Teacher 4: Teachers in the high school and elementary school will also read that.

Res.: We have had much less coverage this year than ever before.

Teacher 3: Would anyone like me to take pictures? I have a camera and black and white film that the (local newspaper) gives to me for student council activities. Amy is spread quite thin. (Reporter) liked the children so much that he went into teaching! He was always here. Sometimes he'd forget to take pictures because he would get so engrossed in what was going on. I call (new reporter) for everything.

Res.: My experience with her is that if you give her something, she will turn it into an article. She doesn't come in to delve into this kind of thing. She will come in to try to expose a story (laughter). I do feel very comfortable giving this to her after it is finished.

Teacher 3: If someone would volunteer, I do have the film or do the write-up. It's her time.

Res.: What we are talking about is a big feature story where this would be the basis for the text. What do mean by volunteering to put it together?

Teacher 3: I mean on an ongoing basis to keep people informed.

Res.: I think this is something that I can polish up to give her for an article in September.

Teacher 3: The elementary schools have reporters. Couldn't we come up with a format to use on an ongoing basis? Students to write? It doesn't have to be a big story. This is a general interest story. Then she would not need to come out. The librarian at the elementary school will usually take stuff, but this does not necessarily need to be the avenue it goes through. Another avenue in this school.

Res.: We have a creative writing club that used to be a newspaper club. It changed because that was where the interests of the kids went. It is very well attended, but it is not focused on newspaper articles.

Parent 6: Even that. A lot of kids' work could be in the paper. As long as she did not have to come to the school...

Res.: This could all be part of this ongoing Project Improvement Team. I think we need to move ahead. Is there anything else that needs to be moved under consistency and communication because all of the other stuff will wait until later on.

Parent 4: I think that (what is on the chart) is a pretty tall order.

Res.: I believe that a lot of what is here is for the committee that will work this summer. Just do it! Right?

Teacher 3: Do you want to delegate right now? I see that your name is down already for the three things you volunteered to do.

Res.: I don't know. I knew what I had promised to do at our last meeting. I guess I was "modeling" filling in the chart! (Laughter)

Teacher 1: We're going to be here this summer to do this.

Res.: What I could do is just type up the list of the things we are going to do.

Teacher 1: What parents could do is organize...

Teacher 4: It says, "Improve notetaking skills." Would you put someone's name there? I can't figure this out with the person responsible column. I don't understand that at all.

Res.: I think that was something that did come through though. I think there could be some sort of communication between you and (English teacher) who is our English coordinator. Try to have every grade level do some sort of activity early in the year to enhance notetaking. It may not fit into her plans, but I don't think it would hurt to have communication between the English and science teachers at each grade level on this topic. For instance, research papers in English often come near the end of the year. Do we need to do more of that at the beginning of the year to refresh kids' minds about webbing, outlining, and those kinds of things.

Teacher 1: A lot of these things should be going on. Some of them are easier than others to put into place. The whole school is working on assessment rubrics, right? something like grade level meetings at 6th grade... The teachers should meet and write them together or whatever.

Res.: One thing - files of articles in each classroom... This is something that was suggested that this be a parent initiated thing. That could be something that is assigned to a subcommittee of the PIT. This could be one teacher working with 2 or 3 parents to put together a request letter, "This is what we need resources for, and if you will send these in to such and such, we will sort through them and duplicate what we need.

Teacher 1: Some of these things... Do we see this like a letter that we write this summer? Explanations to parents about what help is appropriate? Or do we explain it at parents' night?

Res.: It could be at parents' night or a fourth section in the article I've started. Those are things we need to figure out.

(Jumble of conversations and laughter)

Teacher 4: I'm thinking about how much time this is going to take during the regular school year. Every morning... I'll be removed from my children. It's overwhelming. Just think about it. Overwhelming... The goal of our curriculum writing program over the summer is to enrich and change and enhance the things we have done so that next year they are better. O. K. If you throw this is there, this is two weeks of our time. Basically, we get no curriculum writing done. None. All we can do is this. Not even...

Res.: (Teacher 4). Look up there - enrichment suggestions.

Teacher 4: I know, but that is one segment of it. That is definitely going to be done by all of the teachers this summer.

Parent 1: I think this will make everyone aware of all of these things.

Teacher 4: Yeah.

Teacher 1: Sixth grade did not have a lot of formal grade level meetings. If we go together, we can get this done en route. Do you know what I mean?

Teacher 4: Yeah. Right.

Teacher 1: Some of the stuff can be written at the beginning, but a lot should be written enroute as we go through. Do you know what I mean?

Teacher 4: Yeah, but also we have to think about the consistency from grade to grade and the fact that we should all be doing things to help the kids get from point A to point B in a consistent way so that when they go from 7th to 8th or from 6th to 7th they are walking into the same environment.

Teacher 1: Right.

Res.: Are you saying we should have grade level meetings in the science department to work on these things?

Teacher 1: Some of these things we can do this summer.

Res.: I think a lot of this will fall into place this summer.

Teacher 1: Yes. It will just gradually occur, but I also think - like rubrics that I change all of the time... I am working with (Assistant Superintendent of Schools) on that. That is something that is ongoing as you create a project. It is a lot of work. Some of the things - I think there should be a grade level meeting like every other week. We have already talked about meeting to keep people aligned. I think seventh grade already does that.

Teacher 3: We already meet.

Teacher 1: What goes home to parents... We should have a letter...

Res.: Some of the things that are up here are not going to take a lot of time, Tom. Communicating to parents about what their responsibilities are in projects... That is not something that you will do all of the time. You can write that in one paragraph.

Teacher 1: ...and just send it. That is important.

Teacher 3: (Parents 4 and 3) suggested fall conference time. When everything else has settle down and the dust has settled to the ground and the flurry of new beginnings has calmed down, why when we see every parent don't we explain this is how we should be working together. This is what we expect from parents; this is what you can expect from us. Or, let us know what else we can do.

Teacher 1: Right. We should have something to give them.

Teacher 3: Then they will have time to question - something in writing may be confusing.

Teacher 1: We'll never have time to talk about those issues at conferences. We sit with our team, and the parents want to know about how their child is doing on this test or that. We don't get to be so philosophical.

Parent 4: What if you sent something home in the Friday folder prior to conferences? To every parent and asked them to bring it with them with their concerns. This would give them a chance to think about it.

Teacher 3: Like Virginia did... an outline to read before we come. I think that is a great idea.

Teacher 1: That is good.

Parent 6: When are fall conferences?

Teacher 4: October?

Res.: Let me think. They are the week of election day and the week after.

Parent 6: This is what happened at (elementary school). We had trouble with the open houses. Teachers were saying that parents wanted to talk more like at a conference than an open house. How is my son doing? If they moved it earlier in the year, you could approach it more on a philosophical basis and set the ground work. Parents would be less likely to use it as a conference.

Teacher 4: I agree. They changed it on us. You're talking about open house right? This year it was much later in the year. Before, it used to be, like, in September.

Res.: Open House is always in September. I think it is the 19th and the 21st. How many of you are interested in working on an ongoing PIT? (Teachers 2, 1, and 4) - you kind of have to (laughter)... We did not even envision anything like an ongoing PIT, so I don't think anyone should feel obligated to do it, but I also think that you can't just bring in all new people and explain this to them and expect them to understand the process. I think we need a core of people to continue.

Parent 3: But not every week.

Res.: No. I would think we might need a meeting early in September to help plan a parents' night and then we do the article in the (local newspaper) we put something in the first (school newsletter) - that kind of thing - and then just be available for maybe three meetings in the course of the year as sort of barometer of what has been done and to give us feedback on what the rumblings are in the community. Is there a change in attitude?

Teacher 4: I think if issues come up, we could always convene and say, "These issues have come up, and we've gotten a lot of feedback in this area. I think we should have a meeting to talk about these issues." Then, fit one in here and there. This would help with communication or dealing with a problem or whatever.

Teacher 1: Even teachers need someone to go to - someone they feel comfortable with... And know that the issue will be addressed and handled. Don't you think that teachers also get overwhelmed?

Teacher 4: Yeah.

Parent 4: It may be... We always look at this in terms of parents giving input, but if 4 or 5 teachers see that this bunch of parents doesn't seem to understand us. That may be time to send a letter out to educate parents. We are seeing - at (elementary school) anyway - a real difference in the kindergarten, first, and second grade parents over the parents that are leaving. There is a real change in attitude and what they want and what they expect and seemingly a need to do some educating that maybe wasn't necessary a little bit before. It might be nice for all of those reasons. If we had a formal - sort of a form - that parents knew about, that teachers knew about - that could be sent to the committee with specific - so that everybody who sent it in answered specific questions so that we would know kind of the same information on all of the people that were sending things in - then we could sit down - and whoever the chairperson of that might be or whoever received those would look through those - if we found 4 or 5 or 6 on the same topic, that would be a time to convene a meeting. If nothing comes in, then obviously there is nothing.

Teacher 1: And people, just knowing that they have a place, they don't use it - I've found. I think it is a great idea.

Parent 4: I think it would put their minds at rest knowing there is something there to take care of this, and obviously I don't have to worry about it.

Teacher 1: If they complain, you can say, "This has always been here." You don't throw it in their faces, but...

Teacher 4: This is what we opened up the meeting with - a trouble shooting procedure with a "go to" person. That person would begin receiving information. Hopefully, they would not receive anything. (Laughter) But, if information was coming in... This one we will deal with, this one we won't.

Teacher 1: As long as they know they can call, they don't call.

Parent 2: if you have your door open, it is very different. I think with realistic expectations, too. I think someone calling in cranking - I don't want my child in a class with that child - is not a reasonable comment or something we can really do something about. However, if you have 99 parents complaining, and they are all saying the same thing, then we have something to work with. But, I think the door has to be open. One thing I am not clear about, though. Have we decided that we are doing something at Open House? Or are we having a science night?

Res.: I think it should be separate.

Parent 2: I think they have done that with math.

Res.: There is a math meeting tonight.

Parent 2: With a whole new group, you have an opportunity every year with a new group of sixth graders to say, "This is our science program, and invite all grade level parents to attend."

Teacher 4: the first meeting... I think we should invite everyone. Then, after the first meeting, we would invite the incoming parents - the fifth grade parents every year. We would do that meeting again and let them know.

Res.: That may also be a way of holding ourselves accountable. I'm thinking, "We have six minutes left, and I have not filled in those boxes!" (Laughter) But, I am also seeing that that might not be the way to do it. If we kept this list and know that at this fall meeting we must address with parents and our science teachers everything on that list, that will hold us accountable for this. I don't want to lose this.

Teacher 1: Give it to us this summer, and we will talk to everyone else and take it over.

Teacher 4: This will be in front of us as we do our work this summer.

Parent 1: Worry about who you're going to dump it on later! (Laughter)

Teacher 1: You can't make someone responsible for a no brain activity. Most of these things you just have to know to do them!

Teacher 3: I see that someone must be responsible for figuring out "how to" and passing out this information. I see improving notetaking skills right in there, Tom, with learning how to make observations, to make guesstimates, the beginnings of everything churning around... the tools and the skills that we need to do the whole thing, to live our lives, that we do at the beginning of the year. Some people don't know how to take notes or have forgotten or this is the way we do it.

Teacher 1: But also, a whole cluster should do it. The teachers should all reinforce it.

Teacher 4: In talking to the ninth grade kids, I ask, "What could I have done better last year to help you out?" They said, "You should have forced us to take notes while you were talking - forced us to do that - not put it up on the board - but forced us to take notes while you were talking - because that's what we're doing a lot. We weren't used to it. It took us a long time to adjust to that." Even though it doesn't fall into our philosophy, the kids say they want it because they want to be ready for the next step.

Res.: We also have to do it here because our classes are so much more heterogeneous that you must provide a backup for the kids who can't do it themselves. But, that probably should also be that way at the high school.

Teacher 4: You're right.

Res.: All right.

Teacher 4: I don't want to open up a can of worms hers. (Laughter)

Res.: We have four minutes. My sense is that we do not need another meeting right now. Is that your sense?

Teacher 4: When could we even squeeze it in here? We're at the end of the year.

Res. We have one more scheduled in June, but I don't think we need it.

Parent 4: I was just looking to see if there was anything that a parent's name should be filled in with. Unfortunately, the vast majority of these things are going to fall to teachers, but...

Res.: How about the files of articles? You know - to come up with a letter to parents. As a matter of fact, that could be done now - a letter to parents saying, "Start amassing these things. This is what we envision. I think I could sit with someone and knock that out in about fifteen minutes.

Parent 4: I think what we would need would be a teacher and yourself to give us lists of the types of articles and publications you might like to have in your classrooms but that you do not have access to on a regular basis. I can't make up that list. I would be happy to put something together if someone would sit down with me and give me a ls it so that I can write it and figure out a way to send it home and not be garaged with cartons and cartons of recycled material that we don't need.

Parent 1: (Parent 5) and I will put those lists together for you. He has already volunteered to do that. There is so much easy stuff.

Parent 3: Don't you want feedback from teachers though. I mean, maybe they want stuff on space as opposed to...

Res.: I can give (Parent 1) a copy of our scope and sequence. That would be enough.

Teacher 4: That is all you need.

Parent 1: There are so many inexpensive journals out there - professional journals but also things like Discovery , Omni...

Teacher 4: Exactly.

Parent 1: A lot of us get even advanced magazines.

Parent 4: We need a list from the teachers on what they need.

Parent 1: Go to the library, and make a list or find somebody like myself or (Parent 1) who can go through at some of the industries and take the whole article and be done with it. The school will need to come up with a repository for this. Somebody might need to cut out the articles and copy them. There is a huge amount of information out there. A lot of it is intended for a general audience.

Parent 4: We need to do a little brainstorming on how to go about this so we don't come up with something we're not looking for. You don't want too much stuff. You just want what you want and need.

Res.: I will get copies of our scope and sequence for you. This will tell you the topics covered at each grade level. I think one letter to try to collect other information from teachers. I don't think this is such a big job. This should be enough to get it going. The job will be to keep it ongoing and maintained. These articles go to the eighth grade teachers, these to the sixth, etc.

Parent 4: Do you want just articles or magazines?

Parent 1: Both.

Teacher 1: Kids will read this stuff during SSR even if it is not related to the course. They always grab my science stuff.

Parent 1: The (local) newspaper had a wonderful article last week on gamma ray sources - tremendous. I loved it.

Res.: I would like to invite each of you to be interviewed about the process that we have been through and how you feel about it. If you would like set a time now, or I can call you at home. I can see the teachers the last week in June, if necessary.

TO: Members of Science Project Improvement Team

FROM: Virginia

RE: Summary Statements for May 25

DATE: May 31, 1995

Following is a summary of our May 25th decisions:

Our June 8 meeting is cancelled because we agreed that the science teachers must tackle the items we have identified as procedures that will improve consistency and communication within the science department. Note: These are listed on the last page of the attached transcript of the May 25 meeting as well as on the last page of this memo.

Virginia will interview each member of the Project Improvement Team at a mutually agreeable time during the month of June.

Plans for Improving Consistency

The four teachers who are members of the Project Improvement Team (PIT) will share the team's decisions with the other members of the department at the June 13 department meeting. The curriculum writing team will plan for incorporating the changes we have listed either during the summer work week or en route as units are developed during grade level meetings throughout the year.

The concept of a 1" separate binder for science (in lieu of a textbook) will be introduced at the June meeting. If approved, Virginia will present the idea to the study skills committee for inclusion in the list of required supplies. (Note: Coincidentally, the PTA is providing seed money to establish a school store to be open before school in the cafeteria. If approved by both members of the department and the study skills committee, I will communicate the need to stock 1" flexible covered binders for science.

The consistency issues that are "no brainers" such as hole-punching of handouts, stapling of packets, and improved quality of copy will be discussed within the department and implemented in all classes in the fall.

The teachers who are members of the PIT will communicate with Nancy Martin and the other teachers at their grade level regarding the issue of improving notetaking skills.

(Parents 1, 2, and 3) will facilitate the development of grade level files of articles and periodicals. Virginia will send copies of our scope and sequence to (Parents 2 and 3). The science teachers will develop a list of periodicals that would be of value to students and will send these to (Parents 2 and 3). (Parent 1) and Virginia will develop a letter to parents to explain the notion of classroom resources and to invite their participation in the project.

Grade level science meetings will be reestablished to ensure equity and consistency.

Plans for Improving Communication

A "Science Parents' Night" will be held early in the fall. Its first purpose will be to explain the history of the program, this goals, the data that was collected from the survey and focus groups, the work of the PIT. It will also provide a forum for introducing the concept of an ongoing PIT, identifying its members, and suggesting ways that parents, students, and teachers can collaborate to enhance science education at our school. The members of the ongoing PIT will meet in September to plan this meeting and to devise ways to publicize it.

The draft of the handouts for parents that Virginia distributed at the meeting will be completed and distributed at the "Parents' Night." We agreed that the opening paragraph should include a statement of intent - to establish a basis of trust and commitment on the parts of parents, students, and teachers to be able to say to each other, "This is what we need," and to ensure that those needs will be fulfilled whenever feasible. In other words, the continuous improvement of the program is rooted in a climate of open communication and collaboration. A section on parent, student, and teacher responsibilities will be added to the handouts.

Separate one-page handouts with bulleted highlights of the program will be distributed over several weeks in Friday folders.

Virginia will contact (reporter) at the (local newspaper) to investigate the possibility of a feature article on our program. The handouts will provide a basis for the article.

The names of members of the ongoing PIT will be published in the "Lion's Roar." A trouble-shooting procedure and a related form will be developed for parents to ask questions, seek advice, and voice their concerns about the program.

Tasks we agreed to accomplish to satisfy the concerns regarding our science program:

Improved Consistency

1. same packets for all students in all clusters at each grade level
2. notetaking skills - Improve.
3. rubrics (especially for projects) - clear purpose, maximum amount to be spent for materials, roles of parents
4. numbers and kinds of activities and homework assignments
5. connections to real world
6. enrichment - files of articles in each classroom, bibliographies, books for supplemental reading (Karen, Bill, John)
7. assessments
8. required oral presentations on current science topics (formalized)
9. format: pre-numbered pages, syllabus, hole-punched, pages stapled or bound together, improved quality of copy, separate 3-ring binder for science (1", flexible binder), key words in italics or bold

Improved Communication

1. "study guides" for parents
2. deadlines
3. history of science program (Virginia)
4. organizational plan of program
5. textbooks as resources (Virginia)
6. enrichment suggestions
7. deadlines and checklists for students (teachers to check)
8. results of surveys, focus groups, PIT work (Virginia)
9. explanations to parents regarding what help is important
10. raise awareness among parents, teachers, students regarding peer pressure (on gender, ability groups).
11. communication to parents to share articles/periodicals that are relevant
12. suggested communication vehicles:
    "Lion's Roar
    meetings with parents
    letters to parents
    signing tests
    Friday folders
    tear off sheets for parent responses with deadlines for responses
    ongoing Project Improvement Team with meetings 3 or 4 times per year (names of members In "Lion's Roar" as resources)

APPENDIX T

Sample of Transcript of Interview[18]

Interview of Parent - June 8, 1995

Res.: Prior to working with our project improvement team, in what ways have you been involved in schools? I know that you are the PTA president at HoM...

Parent: Outgoing...

Res.: Are we getting your last child now?

Parent; He is going into fifth grade.

Res.: So you will be with us for awhile! You were also on the gender equity committee.

Parent: I am not so active on that because their meetings always conflict with other meetings that I have. I've been getting to them whenever I could and getting their minutes and that sort of thing.

Res.: Have you had previous involvement have you had with this school?

Parent: Here? No. This is really the beginning. I've been trying. Actually, I am on the PTA here as the corresponding secretary.

Res.: I have not been to PTA meetings this year because of my courses at TC, so I did not know that. As a matter of fact, my class this fall at Columbia will also fall on a Monday, too. I'm a little out of touch.

Parent: That's kind of a do-nothing job. I took it so that I would start to begin to get involved here.

Res.: IN the course of our work on the PIT, if I had been shadowing you, what would I have seen that relates to our work but did not take place during our sessions? (Silence) Did you have conversations with other parents - positive or negative - about what we were doing?

Parent: I had conversations when people would ask specific questions or make specific comments about science. I would bring up this committee. I can't say that there were too many. I haven't... Mostly, it would have been parents of younger children asking, "Well, how are things at the Middle School, and what kind of input do you have there?" More by way of information... I haven't heard any negative comments from people.

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[18] Interview of Parent - June 8, 1995

Res.: When I spoke to (another parent member of the Team), she said that because many of her friends have children who are younger, others ask her chastens because they are apprehensive about what lies ahead. What do you believe has been or will be your most important contribution to the development of the science program at our school?

Parent: Probably the communication thing. I don't really see parents... Well perhaps, like (another parent member of the Team), because he has background in the teaching as well as in the field... I could see him doing a little bit more liaison work in that regard, but I think the rest of the parents can bring the good and communicate it out to the rest of the world, and for us to bring back comments from them for further work or whatever.

Res.: So you see a two-way communication?

Parent: Yeah.

Res.: But you are also very interested in this business of providing classroom reading resources.

Parent: Oh, yeah. That seems like something that we will just do. Get it going. Then it will just need some upkeep. I don't see that as a major communication. I think that ongoing communication is probably the most important thing. I think that in almost all situations in schools that I have gotten involved in because there were concerns, it has been more that exactly what is happening in the school is not being communicated. Once parents found that out, they were happier. It was the fact that they were assuming we were not doing things the right way that was causing them to be concerned. Once they found out... I'm sure there are always those few who aren't happy once they found out either, but for the most part, I think it is a lack of understanding.

Res.: What were the strengths and challenges of the parent involvement process? (Silence) Is there anything we skipped, or was there too much?

Parent: I think it was well done. It followed a good or reasonable progression from gathering information to working with it more intensely. I think there was a good mix of teachers and parents in the group. The one thing that you will never be able to address in a group like that or even address very well as an administrator is the fact that there are always going to be some staff that are not going to do it the way you are hoping it will be done. That is your worst enemy because those are the people that make the parents have a legitimate gripe. No one has a legitimate gripe with the teachers that were in that room - I don't believe. It's just on and off someone. I'm sure you are going about that the best way you can with mentoring and what have you. There is nothing that any of us can do there.

Res.: Suppose we are successful, and I am hoping we are, with these packets. And I don't think that ever paper that every teacher will use need be in the packet... In other words, there should be some latitude for varied experiments. You know that you can teach density through solids, liquids, and gases for example. Some people might use one approach, others might use another. If we could have just the informational stuff - the textbook stuff - like a syllabus, a brief unit outline, a vocabulary list... Do you think this will help to bring these other people along?

Parent: The other teachers? The one that I have been concerned about seems to be improving with time and colleague work. I don't believe that anyone that is in this field has the intention of not doing a good job. I think there is often a misconception on exactly what a good job is as times change if they do not change along with them. It is difficult. I think that the more information they have, the more standard it is for them, that is going to improve the students' experience. The more they have at their disposal to work with... I think the better teachers don't need textbooks. The teachers that are grappling with it and not quite as experienced are the ones who need all of the resources. I could imagine that a new teacher would need many more resources handed to them than a teacher who has been here ten or fifteen years. I guess the material being across the board to all the classrooms the same and handed to a new teacher coming in should help.

Res.: I'm really hopeful for that. Teaching has always been an isolated profession, and there has always been a kind of suspicion about working with other people that I never understood. I can remember offering someone a unit that I had a developed when I was first here and we had nothing - different texts in each class, different emphases. Some teachers teaching grammar, others creative writing, and never the twain shall meet. We were expected to develop our own stuff. I can remember a sense that the other person was feeling, "Why is she doing this?" Suspicion. I just wanted to give him something so he would give me something back! (Laughter) I do not understand that, but I am also a latecomer to education. A lot of people in this building still have twice as much experience as I have.

Parent: The newer you are... The more recently you have been through school makes a big difference because it has changed so dramatically over time. The thing with science that makes it so difficult as a parent too... You know, in math you know if your kids can or cannot answer the questions that you ask them with respect to grocery items or fractions in cooking or whatever you might ask them. You have a way of assessing their skill. Likewise in reading. They either can or can't read up to your expectations. Everybody does it. You see them doing it every day. Science is not as easy to quantify because there are not typical everyday things in which we can see a progression unless you take the time to sit down and do problems with them. And I am not sure that is such a typical thing that most parents do. So it is harder for parents to see, and there is where their suspicion begins. Like, "What are they learning? I can't really se anything." And they can't really see, and they probably should not see anything early on. Over time you hope they are approaching problems in a more logical way, and you hope that is coming partly from the science curriculum, but it is difficult for parents to really see that. I would think that in that area it is probably most critical that we get them information, as much for their own knowledge as for the kids. I think we have made a great start. I feel positive about all of this. I feel positive about the teachers reactions to it. I look forward to seeing...

Res.: We are having a department meeting on Tuesday, and I am not going to take a lot of time, but I am going to ask them to list periodicals, tell them exactly we did cover. I have a sheet there that will tell them this.

Parent: I have a letter, by the way, about the periodicals. I'll let you take a look at that.

Res.: Great. I will need to run it past the principal. He approves everything that is sent out. What three adjectives would describe how you feel about your involvement in the development of the science program?

Parent: I am really satisfied. Ever since the girls started here, I've been kind of looking for a place and it never quite worked out. I really feel that this is a positive thing for me to be doing. I feel it is an area where I have something to give, and an area where is has been well received. I'm happy to continue with this. It has been - all around - a very positive experience.

Res.: So this has kind of given you a foothold then?

Parent: Yes.

Res.: Do you know of other schools that have involved parents in the development of school programs? If so, in what ways? (Silence) We have the governance council, but this is the only thing that I am personally aware of, but

I am not talking about studying bus routes. Basically, I've seen the discipline thing... Other than that...

Parent: At (elementary school), there are two committees that have parent involvement in actual subject areas. One is technology, and (local parent) chairs that as well as working on the district one. And, I think they have actually gotten involved in a scope and sequence and interpretation of it for the purpose of staffing and buying software for the lab. That may be one area where parents have not had as formal an input process as this, but have had some input.

Res.: What is the other?

Parent: The other is the math/science committee over there which is, interestingly enough, the thing that got my foot in over there. The first month I was here we started the math committee because another person and myself had both come from different areas in Vermont that both experienced the same math program in Vermont, and were taken aback at how far ahead our children were in coming here. We began to look into that. At the same time, (elementary science coordinator) was hired and was working over there. The three of us began this committee and have had parents involved. It has not been a formal kind of thing. We have been bringing concerns to her through that committee, and se has been working with us to improve things. Again, not a formal process like we have had here, but a little bit of that sort of a thing.

Res. O. K. In what ways was our Project Improvement Team successful and unsuccessful in addressing the issues that were raised in the surveys and focus groups?

Parent: I think that we were successful. I believe that we got through to the nitty gritty of most of everyone's concerns and addressed them. I am sure that there are parents out there who will believe what they want to believe and will believe that it was one of those things that we did to make them feel better but that there are teachers who are not doing their jobs. That perception never goes all the way away. However, certainly we have responded to their concerns and have done something that many of them were concerned about which was in the area of the textbook and the papers and organization. If that gets taken care of, and we publicize that, that should take care of most of the concerns.

Res.: How would you characterize the process that was used for involving parents in our science program in relation to other collaborative efforts in our schools? (Silence) In terms of participants' commitment? satisfaction? Not just for yourself, but others. Do you think this kind of thing will allow parents and teachers to experience those kinds of feelings?

Parent: What do you mean?

Res.: Traditionally, parents have been involved by helping their own kids with homework, in terms of fund raising kinds of things, in terms of general PTA. These are all collaborative things. They are always working with school personnel. But in terms of overall satisfaction... Do you see any difference?

Parent: For me, this is much more satisfying. I suppose that being a PTA president was not really a fitting job for me because I am not really a PTA person. I see myself more as being interested in the curriculum and how it works and why it works and looking at concerns and trying to make them work out within the framework of the school and parents' needs. This is something that I really enjoy. You know, the fund raising and the cookie sales and chaperoning field trips and something I do, but that is something I make myself do. This is something I look forward to doing. I think that more parents are, at least certainly in (town), more parents are interested in this kind of thing as time goes on than they are in the old fund raising and PTA meetings and things like that. I believe that parents are becoming more interested. You don't want to have so much input that you can't get the job done, but to have their interest, concern, and expertise to help and stand behind the schools can be a wonderful combination. If we can get to the point where it will really work...

Res.: What are your hopes for our science program as the result of the parent involvement process? One of the things you have already said is parent expertise.

Parent: Yes. The teachers that we worked with in the group were obviously very well qualified for what they do and have had some wonderful education. But the fact remains that because they are teaching they are not in industry or in other places where some wonderful things are happening daily. To have the parents who are in those fields be able to collaborate with the teachers who are teaching the material and give them the latest up-to-date information and some new information whenever it becomes available and get that to the kids is wonderful. If parents can understand their role as being that sort of - what would you call it - sort of a consultant kind of a role - to bring the science from outside tot he teacher and the teacher can use that to the best advantage knowing how to educate children... That would be awesome. We're getting there.

Res.: What else would you like to add about the process for involving parents in our science program, its implications for improving our science program, its significance for the future, etc.?

Parent: Just the one thing that we touched on the phone the other day - to make it abundantly clear both to teachers and to parents where the line is between the two, and that we are not here - nor should anybody misconstrue that we are here - to oversee teachers or tell them how to teach or critique their teaching or any of that sort of thing. We are here to help them - to augment their work and to get to get information passed back and forth between the parents and the school. We don't want to give parents the idea that they have more power than that, but to welcome them at the same time to give what we would like to have from them, and to have teachers understand that parents hopefully, will know that line and not cross it. There is always that - the more parents become involved in schools, the more you need to begin to deal with those issues. I've seen parents get the sense that because you ask for input that their input will be taken. I'm delighted to be able to give input, but I understand that it will be factored in with a number of other pieces of information and may or may not be used. The parents have to understand that it is being looked at, but it they don't use it, it is not because they did not care.

Res.: I was totally amazed at how parents used individual examples but also stayed totally focused on the input from the 300 parents. Wasn't that amazing? I don't know if I could have done that as a parent if I weren't in the schools and seeing the bigger picture. Parents were able to step back; teachers were able to step back and look at the whole rather than as "my class." They didn't take things personally.

Parent: That is true. I'm not sure that every group can be that productive because of those kinds of things. I've seen these kinds of meetings deteriorate when the decision is not to concern ourselves with the teacher who may not be working up to par - and the parent who is there because that was what their concern was gets wild and crazy and doesn't let the meeting go on. One time there was a meeting about aides and the issue was whether to keep the aides or let the class get larger in size. The aide was arguing for the aides, not because it was better for the kids but because she did not want to lose her job. A teacher was arguing because she did not want to have to teach a class that would be so large. That was not the point of the exercise. My child happened to be the one of the ones that was going to be in that class. I tried to walk into to walk into that discussion and not be (son's) mom but to be a person that was looking for what was to be the best for (elementary school). That is not always easy, but certainly when we take on a job like that, it has to be implied. People should not take it on unless they are ready to walk in and do that. It was nice that was a group tnat could do that.

Res.: That was nice. Of course, they all volunteered. It was not like anyone dragged them in there.

Parent. That is true.

Res.: What were your experiences with science education when you were in the middle school grades?

Parent: Yes, I do. That it was one of those things that I could just go home and memorize a few facts, come back in and regurgitate them on a multiple choice test. I think at the time I even recognized that I really wasn't learning science while I was getting As. It wasn't until I was - I grew up in another state) and I grew up in a tracked system, and I fortunate to be in the top track - in high school where we were still tracked but because of the choices I had made, I wasn't able to be in the science class with the friends I had been through school with. I was in with a less gifted group. It was the first time that I really learned science. They did not know, and there wasn't anyone who could figure it our except me! It was the first time that I had to think every single thing through. It was chemistry. I remember the teacher. I think she was the one who got me interested in science because she made me learn it.

Res.: Where was that?

Parent: (city, state)

Res.: I grew up in (name of neighboring town followed by brief comparison of childhoods).

Res. and Parent: Number of Children: 3 Ages: 14, 12, 9 Sexes: F, F, M
Grade Levels: 8, 7, 4 Most Recent Grades in Science: All straight A students.

Parent: The middle one is probably the one who shows the most natural interest in science. She generally gets a or A- in science. My older one who gets A+ in science - that is really not her thing, but she knows what to do and give back. She knows what to study. They're all interested enough to do the work and keep going with it. I don't think that the older one will... She'd like to be a lawyer, and I don't think she'll do any more science than she has to.

Follow-Up Letter

June 11, 1995

Parent Member of Team
Street
Town, State and Zip Code

Dear Parent:

The purpose of this letter is to thank you for the hours that you have devoted to our continuous improvement effort in science. I especially appreciated your faithfulness in attending our meetings and your contributions in the area of improving communication. Your ability to stay focused on the concerns of the parent population rather than just on your own daughters served as a valuable model for others, and your vision for classroom libraries of periodicals was an inspiration.

Enclosed is a copy of the transcript from our interview which I thought you might like to have. If you feel that I have misinterpreted or misquoted you, please let me know.

We have lots of work ahead of us, but thanks to you and the other members of the Project Improvement Team, now we know exactly what to do. We have finally moved beyond guessing what is needed.

I am very grateful for your help and look forward to working with you again in the fall when we meet to plan our Science Parents' Night and to finalize our handouts and articles.

Very truly yours,

Virginia C. King

APPENDIX U

Samples from Researcher's Journal

1/21/95, Saturday

Last day for collection of questionnaires was yesterday - exactly two weeks after they were sent home in Friday folders. So far, a total of approximately 290 have been received of maximum of 877 sent home. (I say maximum because I have no way of determining how diligent teachers were about saving questionnaires to students who were absent on 1/7, how many students did not bother to give them to parents, how many are still in students' book bags, etc.) Teachers' questionnaires are also in, but it was like pulling teeth to get the last two - two sixth grade male teachers who are famous for "blowing off" administrative paper work.

All parent data now in computer. So far, I know that 66 parents have volunteered to participate in focus groups, 64 by indicating this on questionnaires and signing them, two by sending separate notes. Another 19 indicated willingness but did not sign their questionnaires!

I hope to print out some charts to begin data analysis tomorrow. First dissertation seminar for spring semester is on Monday - a chance for some feedback? Probably should set up a meeting with Anne for Monday, January 30, to go over the survey data.

My plan is to offer focus groups at a variety of times, all within one week, probably as follows:

Tuesday, February 8 - 8:00 AM, noon, 4:00 PM
Wednesday, February 9 - 8:00 am, noon, 6:00 pm
Thursday, February 10 - 6:00 pm, 8:00 pm

Hopefully, this will offer enough opportunities for all to find a session that suits individual schedules, but will also allow me to gather all data in a short period of time so that I will not lose my momentum. This should allow time for me to transcribe the tapes of the sessions before my four day February break (2/17 - 2/20) which I will devote to data analysis.

I'll sign up faculty workroom, order beverages and snacks (coffee, decaf, tea, soft drinks; bagels, muffins, fruit, pretzels, cookies) depending on the hour of the meeting.

1/29/95, Sunday

Struggling with how to organize all of this data, what is important, what is not. Spent yesterday and today at the computer. Presently have 300 surveys from parents. None came in on either Thursday or Friday, so hopefully, we are done - although I'd really like to have a larger sample. Still, 34% is not bad...

Am thinking of setting up this data analysis so I am actually writing Chapter IV at the same time...

2/19/95, Sunday

It's been awhile since I've written in this journal, but that does not mean that I have not been working on my research! This is an interesting but very time consuming process. My focus groups have been delayed until this coming week and the following Tuesday because I just could not wade through enough data to meet the early February dates that I outlined above. Schedule now is:

Weds., Feb. 22 - 8 AM, 4 PM, (6 PM), 8 PM (no takers for the 6 PM time)
Thurs., Feb. 23 - 8 AM
Tues. Feb. 28 - 8 AM

Of the 300 parents who responded to the survey, 73 volunteered to participate in focus groups. However, when I called to schedule them, a few were no longer interested, some never returned my calls (answering machines everywhere), and ultimately, I have 41 parents who have agreed to attend one of the 5 focus groups.

I feel like I'm drowning in data. The responses to the open-ended questions (needs/reasons and comments) are especially difficult to handle. I thought I could code responses and sort on the computer, but I found that I could not see enough on the computer screen. We used a data base (Paradox) and a spread sheet (Quattro) to sort all of the data according to the demographic categories, but the process of coding the open-ended responses is still in the works. I have run each category of data on a different color of paper. Then, I cut out each responses,and move them around on 2' X 3" sheets of oaktag until needs/reasons or comments fall into categories. For example, I ran all of the needs/reasons that were contributed by parents of female students on yellow paper, all contributed by parents of males on green. As I sorted them, a number of categories emerged: resources, hands-on/laboratory, projects, technology, teacher issues, etc. I then used a glue stick to organize the contributions of the individual parents into these categories. The colored paper makes it very easy to note differences in responses of parents of male and female students.

However, this takes so much time. I have 5 demographic questions and two open-ended questions. This means that I must sort the responses by hand ten different times! Only one is finished at this point (comments of parents of males and females), but a second is ready to be glued (needs/reasons cited by parents of males and females).

The short responses led to tons of data. So far, I have thirteen tables of percents of responses in Chapter four, and a corresponding 13 of raw data to insert in the Appendix. I've written the analysis of about half of the tables. The rest is still ahead, and Chapter 4 is already over 40 pages in length.

All of this must be on hold for awhile because the data from first four focus groups will be waiting to be transcribed from the flip chart sheets and back-up tapes to hard copy next weekend. Then, I will devote the next few weekends to data analysis while I am organizing the Project Improvement Team which will generate even more data!

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